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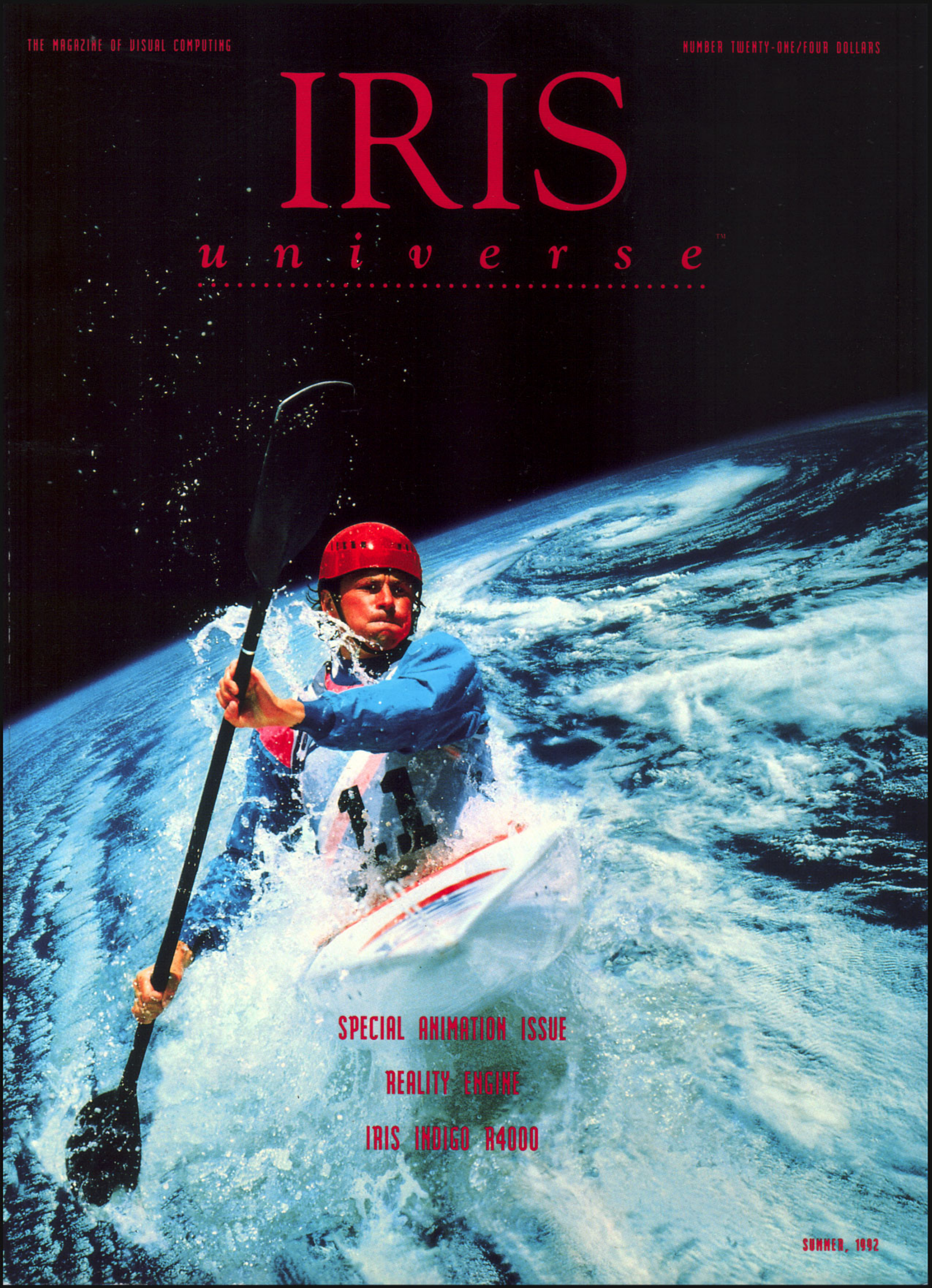

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SUMMER, 1992

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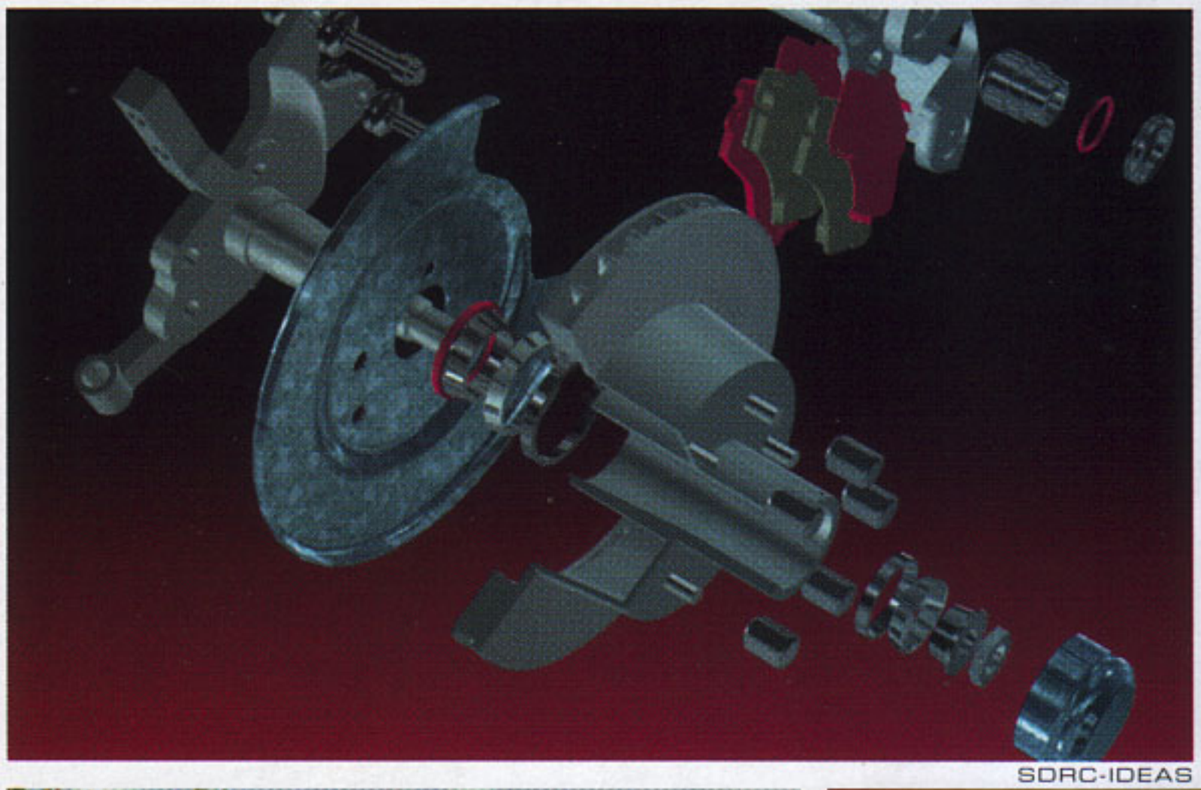

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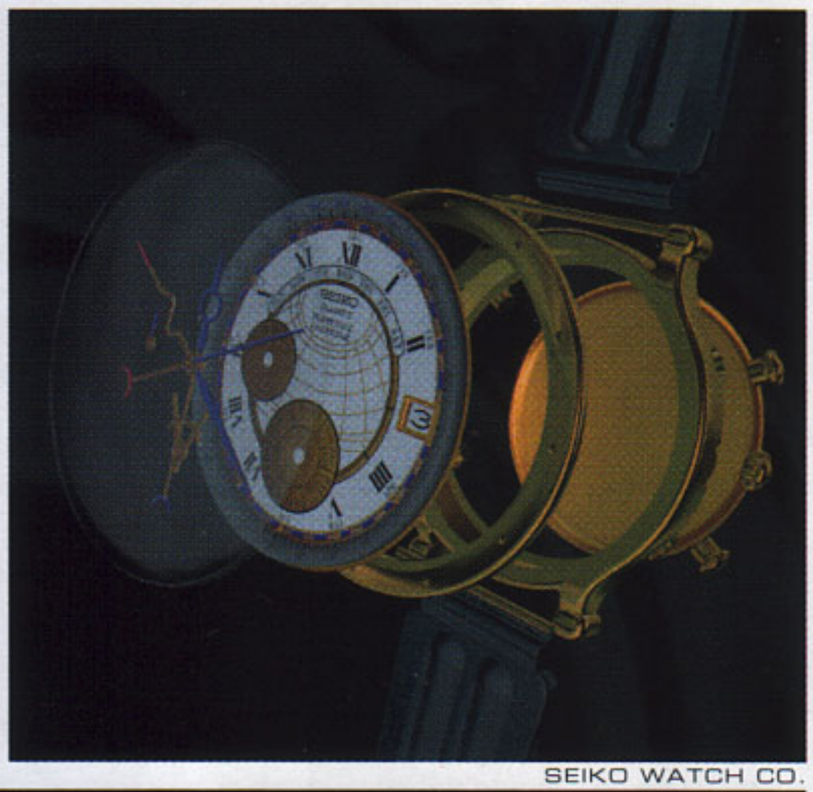

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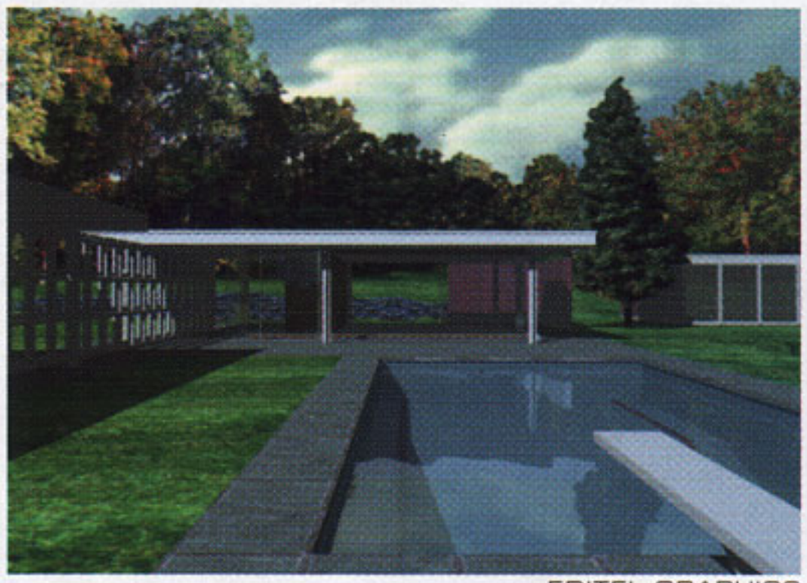

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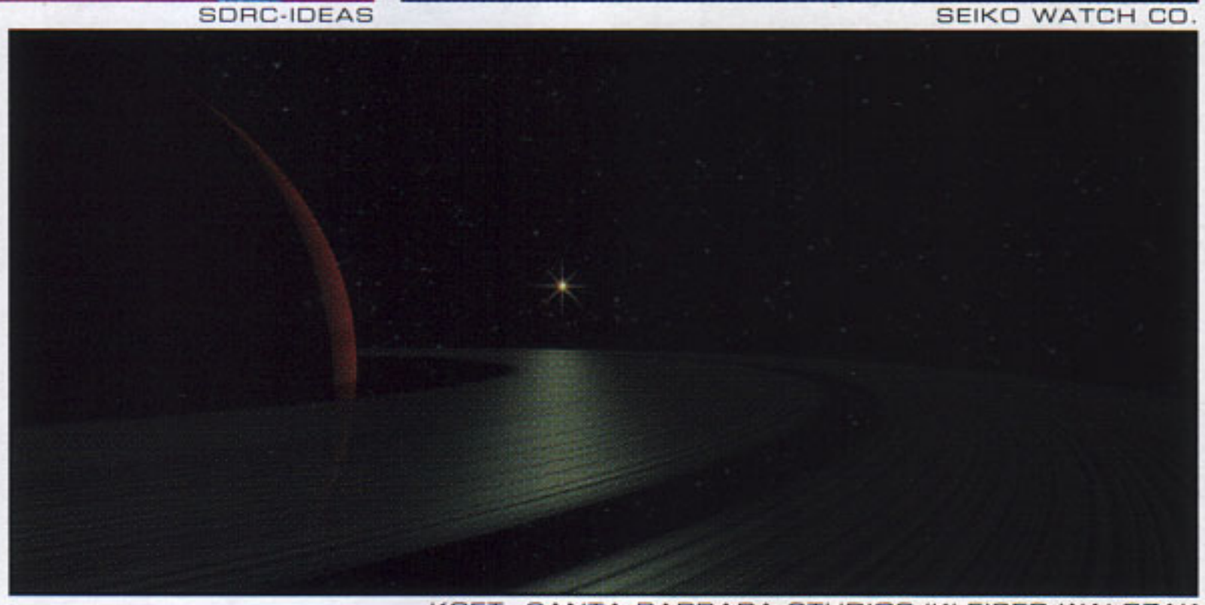

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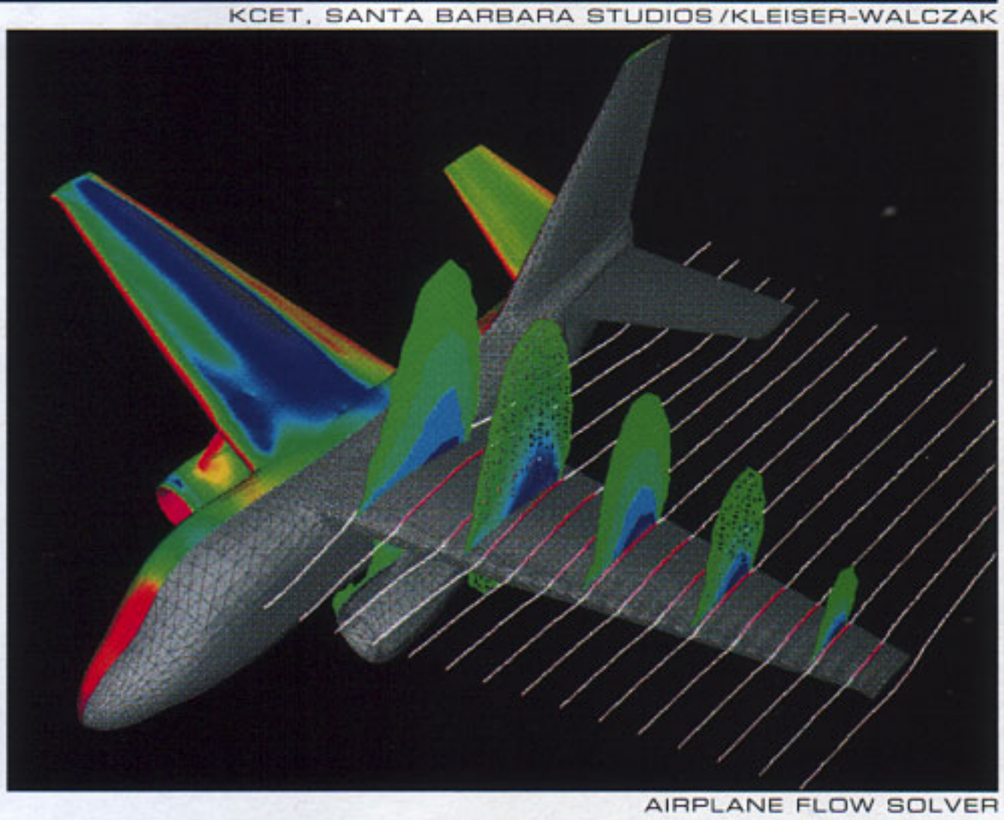

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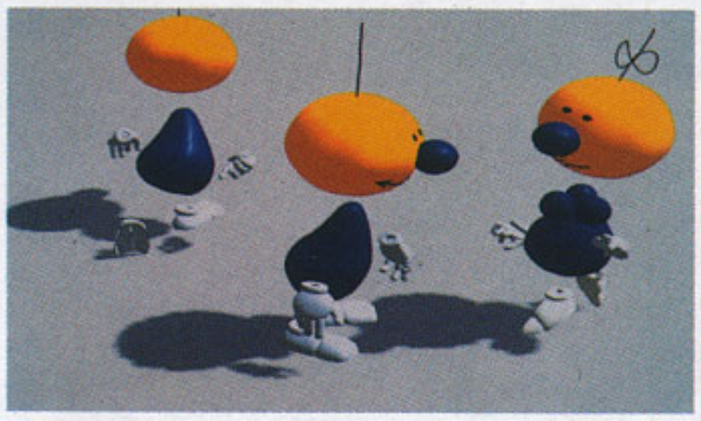

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FEATURES

ON THE COVER
Cover image was produced by Jones Bloom for the Olympics Posters designed by Addison Design Consultancy.

DEPARTMENTS

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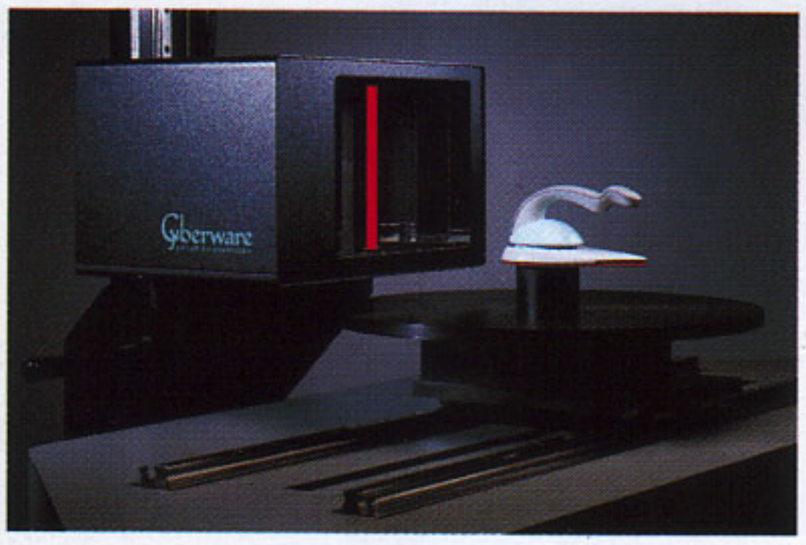

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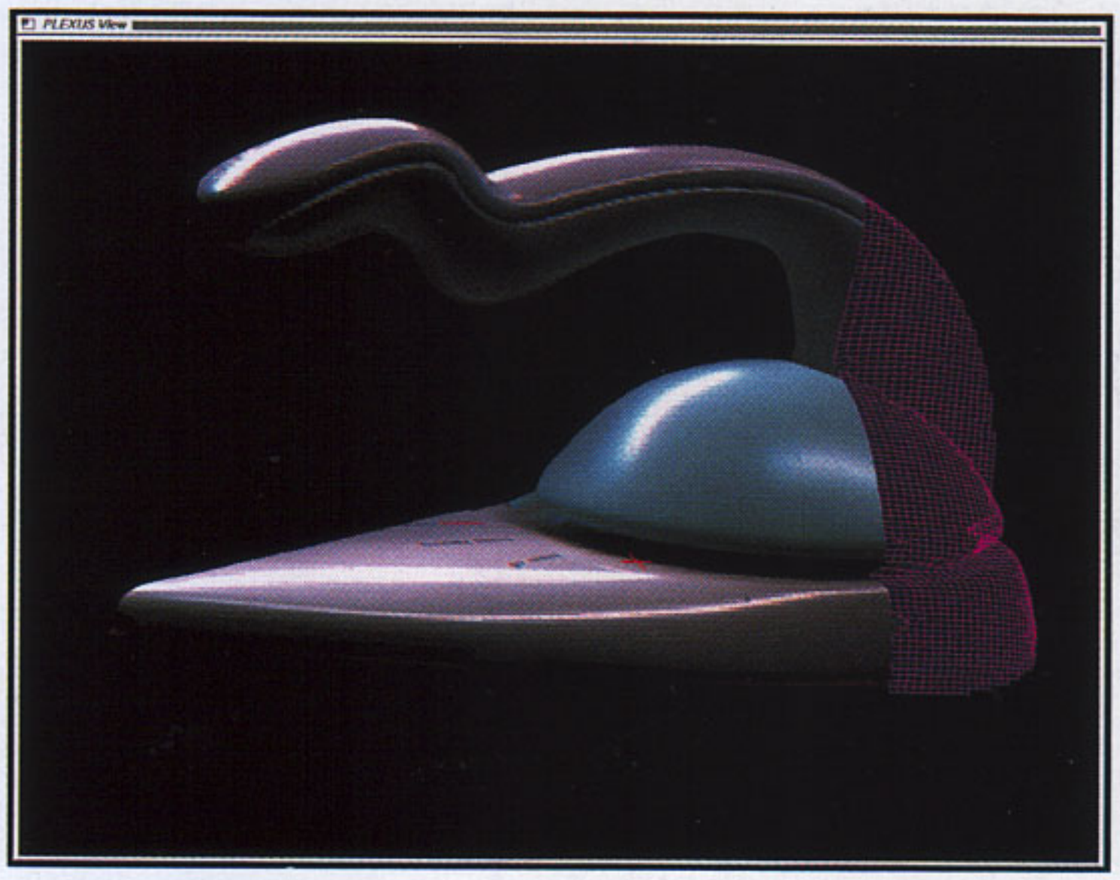
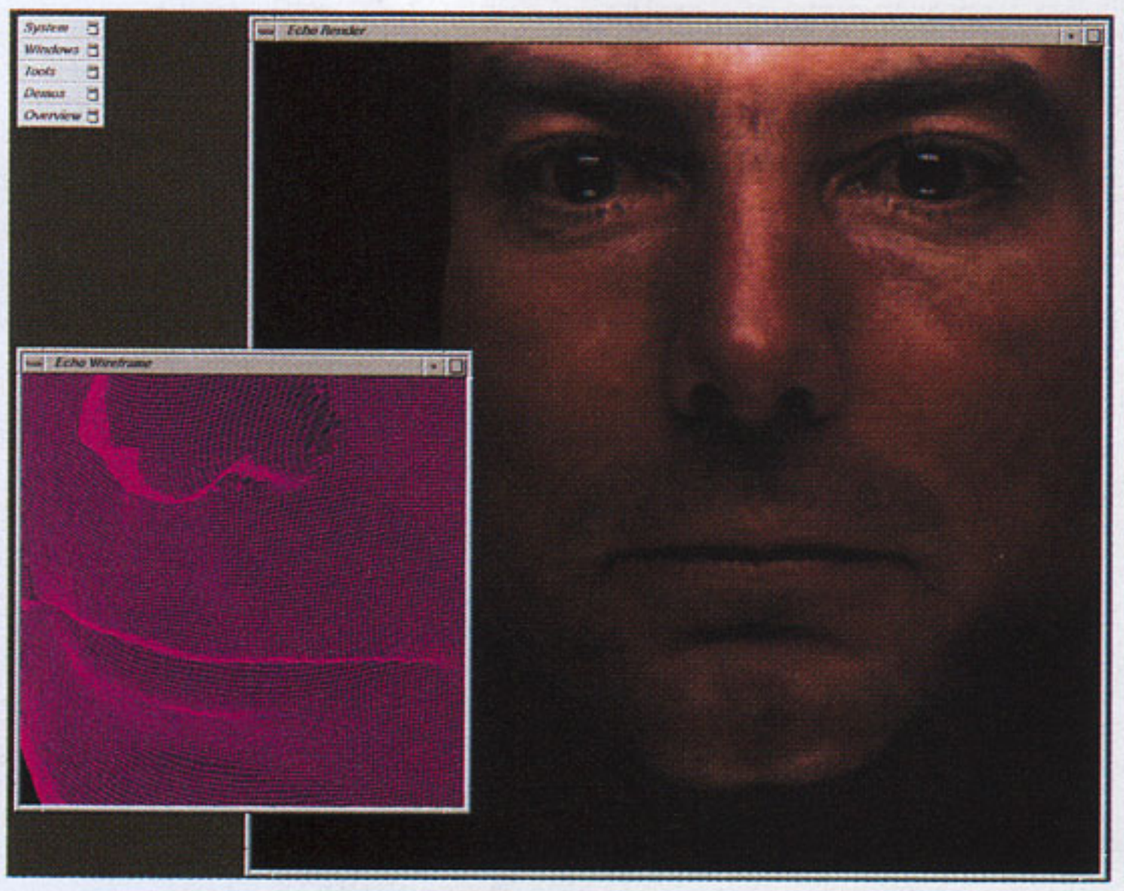


Above • Cyberware 3D scanners let you capture the shape and color of an object, such as this iron by frogdesign, then work with the resulting 3D model on a graphics workstation.

Left • Cyberware 3D scanners like this 3030MS have gone into applications all over the world.

Below • Able to capture even small details of the human form, Cyberware scanners bring a new level of sophistication to designers, researchers, doctors and many others.



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EDITOR'S NOTE

Ultimately, the merger between Silicon Graphics and MIPS Computer Systems was founded upon a mutual commitment to provide customers with the best visual computing technology possible. The marriage of Silicon Graphics and MIPS has resulted in a new type of computer company whose progeny will be systems with tightly coupled CPU and graphics technologies. Additionally, a commitment to true open architecture serves as a basis for research and development efforts on behalf of both the merged companies.

Mutually beneficial to both companies, the merger provides a unique opportunity to leverage each other's expertise, ideas, talents and aptitudes, while providing each with the resources necessary to achieve a level of excellence that is unsurpassed: MIPS will have the resources to continue to develop a successful and open RISC architecture for the computer industry; and, Silicon Graphics will continue to provide its customers with the best technology for visual computing, being assured not only of having the necessary chips, but of having them tailor-made for future systems. Licensing royalties will contribute to the expansion of research and development programs, promising to help reduce semiconductor prices and enable the production of systems at even lower price points in the future. These combined assets will enable the development of powerful systems that will serve the new needs of the computer marketplace in the 90s.

The alliance between Silicon Graphics and MIPS affords to the customer flexibility, stability and great performance for the price—guaranteed as the merged companies will continue to provide customers with cutting-edge, affordable, binary-compatible, competitive systems and open architecture. This newlywed company will continue to be the leading manufacturer of visual computing systems, delivering 3D graphics, color, video, rich sound and real-time technologies to the technical, scientific and creative computing marketplaces—doing nothing less than building the best computers on the planet.

—Anne-Marie Gambelin

Jocs de la
XXVa Olimpiada
Barcelona 1992

Juegos de la
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Games of the
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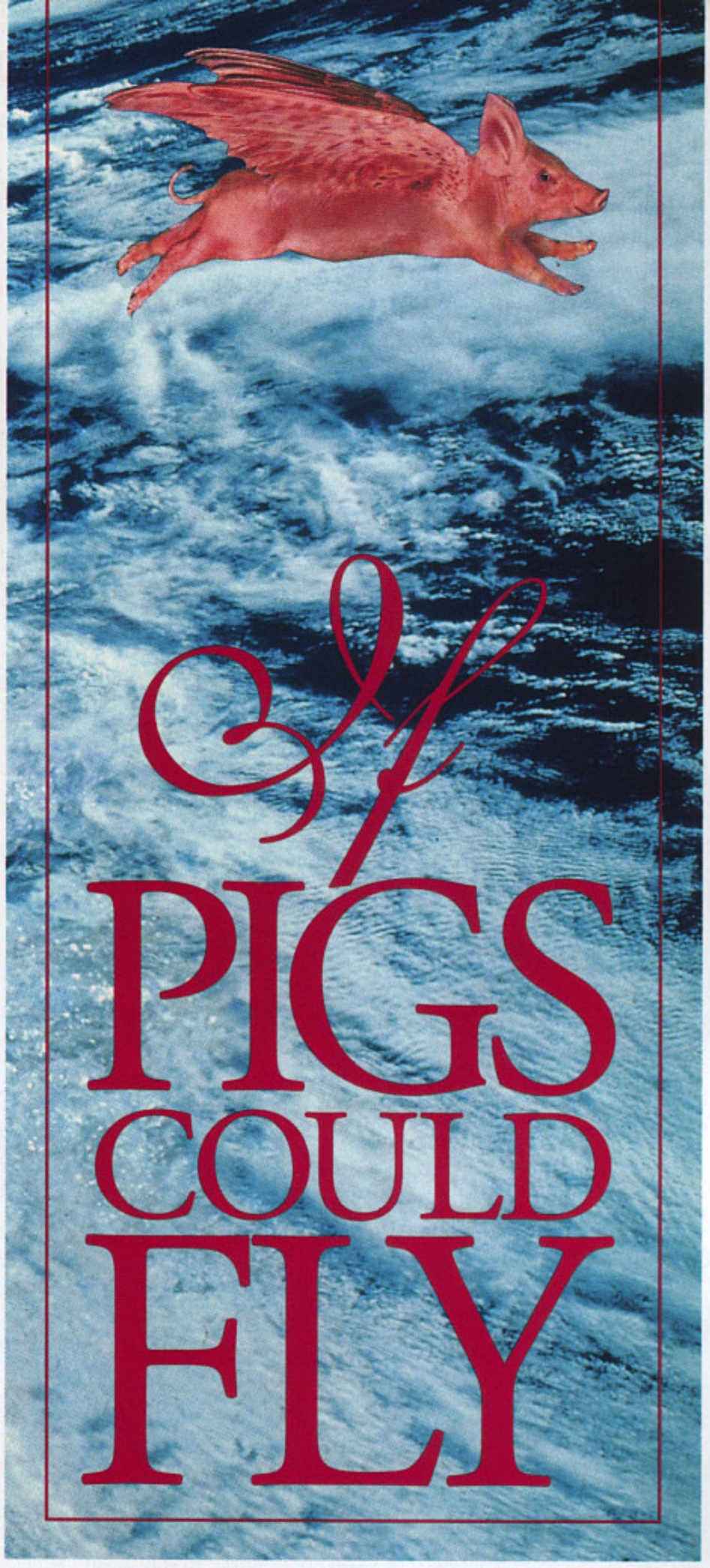


FIVE YEARS AGO, Phil Jones and Steve Bloom joined forces to form Jones Bloom, a photographic retouching company located in London, England. Each man brought with him twenty years of experience in conventional retouching, both men having similar backgrounds as photo composers and retouchers. Using traditional methods, Jones Bloom rapidly built a reputation for high quality photographic image manipulation. In May 1991, the company expanded its capabilities to include electronic retouching that soon comprised the majority of its work. Now with a staff of ten, Jones Bloom has clients throughout nine European countries—primarily advertising agencies, design firms and photographers.

Meeting a deadline that would have been impossible using conventional methods, Jones Bloom produced twenty-nine strikingly beautiful posters for the Summer Olympic Games in Barcelona, Spain. Using Silicon Graphics workstations, the company was able to generate the retouched photographic imagery necessary for the posters, obtain final approval and go to print in less than six weeks.

Addison Design Consultancy, an international firm with offices in Spain as well as the U.K., won the Olympics poster campaign in an open competition that included international companies based in Spain. Their winning concept embodies the Olympic theme, The World Is Our Stadium. Their innovative design mixes 35mm color action photographs of athletes with NASA photographs of the Earth taken from orbit. Each sport in the Summer Olympics is represented by one of twenty-eight posters, with an additional generic poster showing the Olympic rings linked and floating in space above the Earth.

To achieve the effects they envisioned, Addison Design entrusted the production of the stunning hybrid images to Jones Bloom which had already developed a reputation for producing high quality, complex images within tight deadlines.

The creation of each poster involved more than simply mixing two disparate photographs. In blending the images of the athletes so that they seemed to interact with the curvature of the Earth's surface, the retouchers actually had to work in three dimensions, a technique impossible with ordinary retouching. Additional details—such as wrapping convincing shadows around the Earth's surface, keeping a natural and consistent color balance and incorporating water and clouds into a compatible setting—had to be manipulated for each individual poster.

by Crispin Littlehales with Phil Jones and Steve Bloom

Photo courtesy of Jones Bloom Photographic Ltd.

Although relatively new to their Silicon Graphics-based system at the time, Jones Bloom was confident that they could deal with the enormous challenges presented by the Olympics Posters project. By working around the clock, the company was able to make good on its commitment.

Jones Bloom's electronic image manipulation system provides a very high resolution of detail and the power to explore all kinds of creative possibilities by enabling users to handle very large single images and build up complex compositions.

The installation includes a Silicon Graphics 4D/320 multi-processor POWERVision system, connected with two Personal IRIS workstations that act as file servers. The POWERVision system runs a paintbox application package, Barco Graphics Creator, from Barco Industries of Belgium. This system, reportedly the most powerful Barco installation for electronic retouching in England, enables Jones Bloom to build up enormously detailed images, composed of 10,000 x 8,000 pixels.

The entire electronic configuration is set up to execute the three stages of the retouching process—scanning in the image, manipulating it on screen and outputting the completed image. At Jones Bloom, the process begins with scanning in the image on an Itek 310 scanner that has been programmed to scan the RGB colors needed for color film reproduction, rather than the standard cyan, magenta, yellow and black used in printing. One Personal IRIS receives the scanned image and holds it until an operator draws it off onto the Barco workstation. When the operator is done manipulating it on screen, the retouched image is sent to the second Personal IRIS, where it is held ready for output scanning. In this way, the Personal IRISes act as the system's internal storage space through which all data passes.

The IRISes' 2.4 gigabytes of storage is necessary to handle the data that complex images require. Sometimes called second originals, these electronic images are built up at a level below the resolving power of photographic film. By scanning them in such detail that any scan lines are below human visual perception, they can be almost indistinguishable from their original source.

The system's output device is a Kodak light valve technology (LVT) film recorder with a VAX platform. It scans the digital image back to transparency film, which is then processed as either a 10x8 or 14x11 transparency using Jones Bloom's own in-house E-6 processing.

Jones Bloom is one of the few retouching houses anywhere in the world that can do literally everything in house. Although their standards were considered exceptionally high in conventional retouching, Jones Bloom has found that they can do things with the electronic system that they would not have dreamed of in the past. For example, they now are able to zoom in and retouch right down to the grain of the film making it impossible to ever detect the work.

The Olympics Posters project is a good example of Jones Bloom's creative and technical expertise. For each image, the retouchers had to create a glow around the NASA photographs of the Earth to enhance the feeling of space around the planet. They also had to remove any logos from clothing or equipment and match the

color and texture of the blank logo areas with duplicates from elsewhere on the photograph. The three posters pictured with this article are representative of the additional challenges that faced the retouchers when dealing with each individual image, some of which required as much as twelve hours of work on the system.

Transforming the fine detail and color of the Earth's cloud patterns into an ocean or lake for the water sports depictions was especially painstaking. The original photograph of the kayaker showed the athlete guiding the boat through a series of rapids. Jones Bloom had to combine that picture with NASA's image, so that the splashes of water looked as though they were part of the stratosphere around the Earth. In this particular image, the retoucher did not use the option of cloning and using water droplets from another area of the photograph, but chose instead to create the droplets right on screen. All this involves a careful balancing of the two images involved to ensure realism.

The racing sailboat is somewhat similar to the kayak scene, but in this case some of the splashes of water were cloned and moved from other areas of the original. Blending the splashes with the clouds and settling the boat itself into the stratosphere in a natural position involved trying different options on screen before deciding on the best creative solution.

The bicycling poster is a combination of a NASA shot of Earth (this time looking down on the Himalayas) and a photograph of cyclists racing around an indoor track. For this image, the cyclists had to be warped to a very subtle degree to match the Earth's curvature. In addition, the retouchers dropped in shadows that then were modified to fit the scene. Other posters required more extensive warping depending on the intensity and placement of the original shadows. In some cases, strong shadows had to be wrapped around the Earth so as to appear moving naturally around the globe.

Drawing on their backgrounds in conventional methods, both Phil Jones and Steve Bloom strongly believe that the future of electronic retouching lies in a combination of three factors. First, they feel that a retoucher must master the electronic equipment and know how to control and fully use it. Second, they stress the importance of having experience in conventional retouching. Experience, they say, is what develops a retoucher's "eye" for the sorts of things clients want. And third, they agree on the necessity of having creative skills that they feel bring another dimension to their craft beyond merely following a client's instructions.

The successful completion of the Olympics Posters project has convinced Jones Bloom they now have the best available system for their needs. They have found that the creative freedom, reliability and control offered by the system almost lets them paint with photography.

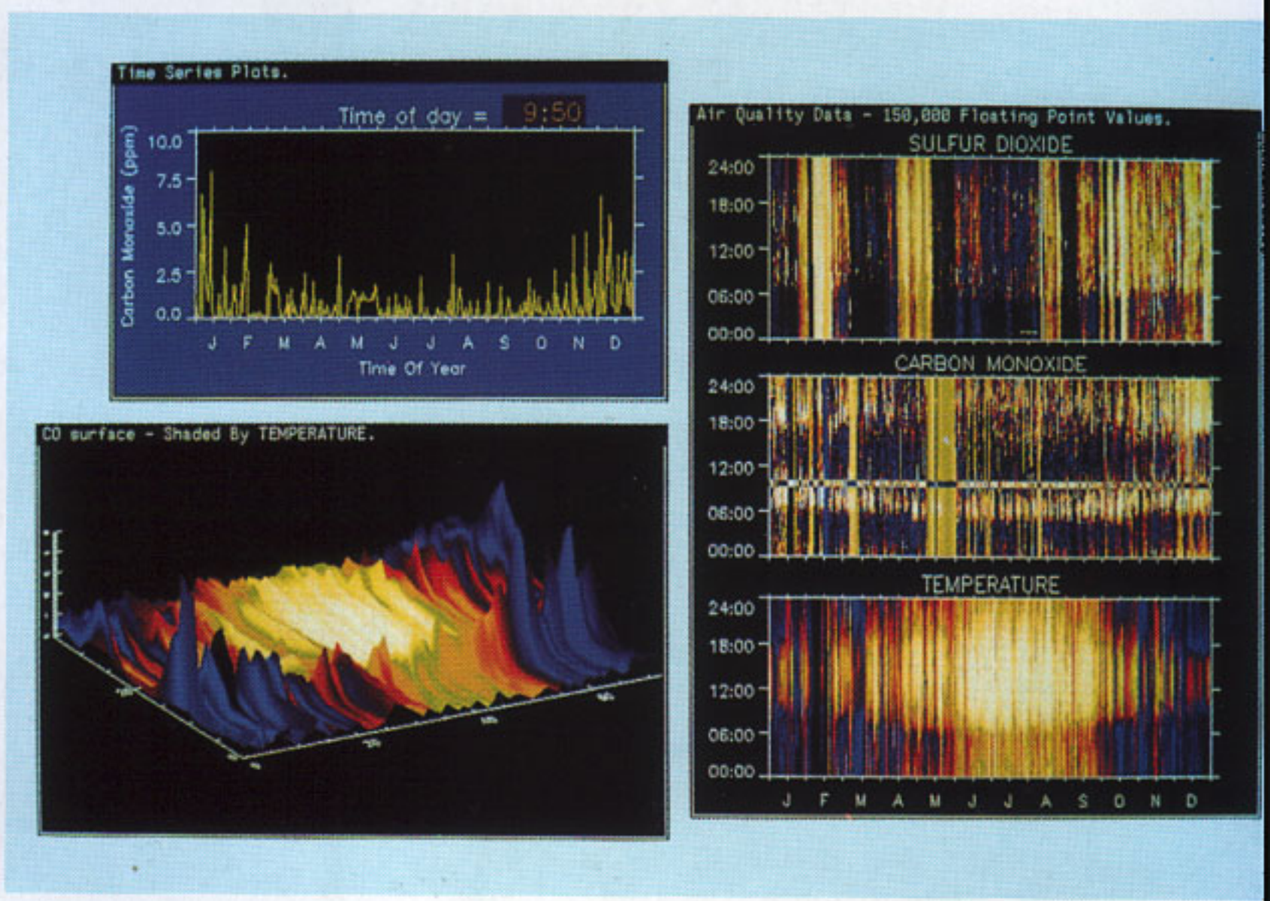
The future of electronic retouching has enormous possiblities that Jones Bloom is eager to explore. The company's logo, a flying pig, symbolizes their philosophy that nothing is impossible. Virtually anything can be achieved on screen now, so if a client comes up with an idea, Jones Bloom will produce the image.

Photo courtesy of Jones Bloom Photographic Ltd.

For more information, contact Phil Jones or Steve Bloom at Jones Bloom, 100 Oxford Street, London, England. Tel: 011 44 71 636 0590 Fax: 011 44 71 436 0442.

TIME SPENT.

TIME WELL SPENT.



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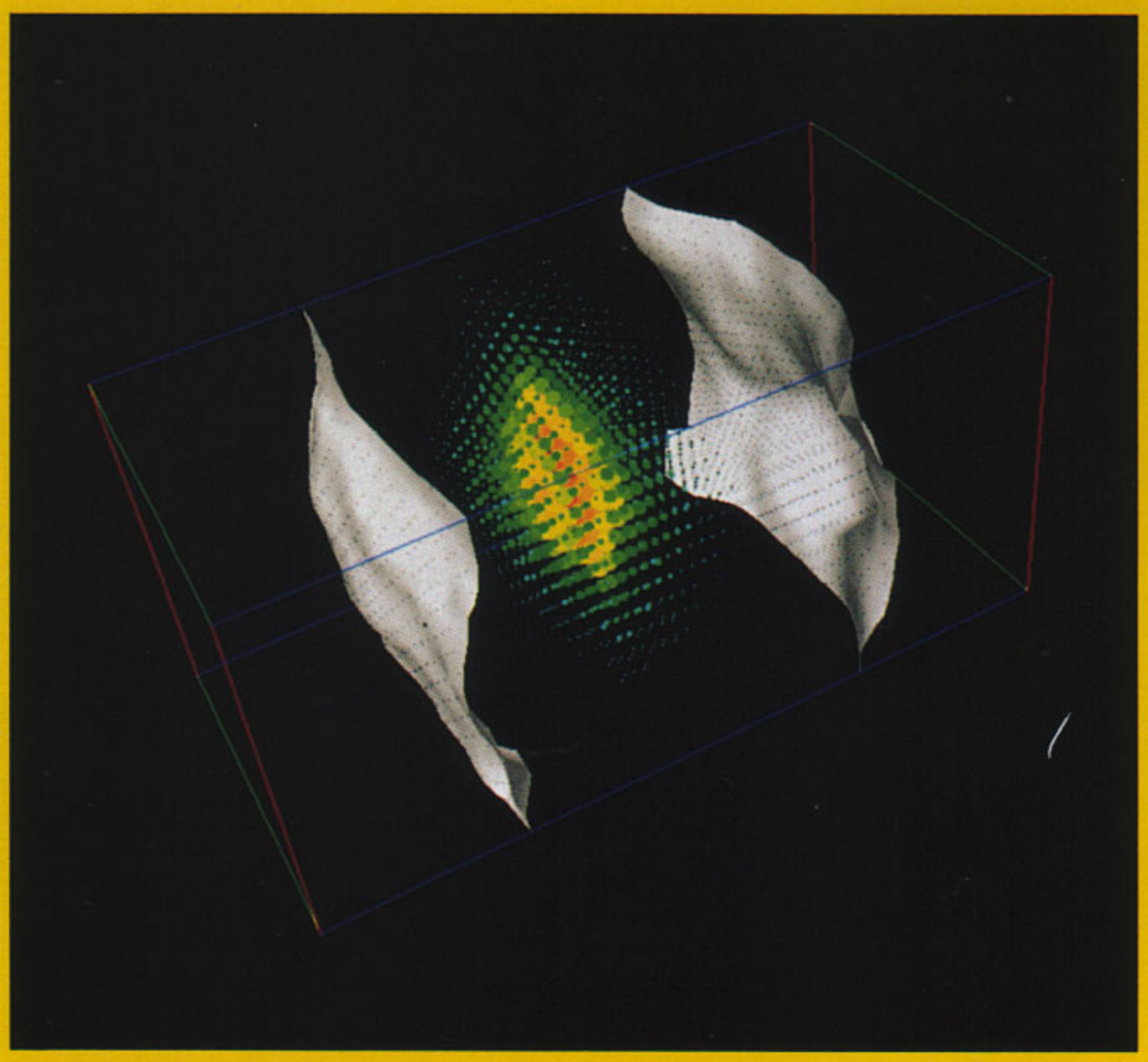
SHOWCASE*ING*

CONTINUING ITS TRADITION as the leading conference for computer graphics and visualization, SIGGRAPH '92 (Chicago, Illinois) will highlight what is and what could be in scientific visualization. The U.S. government, recognizing the importance of leadership in computing and visualization, has, through its High Performance Computing and Communications initiative, funded hundreds of scientists in their pursuit of effective use of computers in visualization. At SIGGRAPH '92, the University of Illinois at Chicago (UIC) has assembled an exhibit of more than thirty of these applications, showing everything from medical imaging to atmospheric analysis.

This exhibit, SHOWCASE '92, covers ten thousand square feet of floor space and is being supported by Silicon Graphics, with over fourteen IRIS VGX and VGXT graphics supercomputers, including the new 64-bit IRIS Crimson systems. The researchers are applying a wide variety of visualization techniques in their applications, many of which were developed at the UIC Visualization Laboratory and at the National Center for Supercomputer Applications (NCSA). UIC and NCSA have been pioneers in the field of scientific visualization, producing some of the most memorable visualizations seen at SIGGRAPH over the past few years. These include the *Visualization of a Severe Storm* and *Smog in the LA Basin* animations created in 1988 and 1990, respectively.

In addition to the visualization stations in SHOWCASE '92, there will be a Virtual Reality exhibit, the Cave Automatic Virtual Environment (CAVE), developed by UIC to demonstrate some new concepts in peer-experiential VR. The CAVE is a 10' cube with projection screens on three of the four vertical sides plus the ceiling. Visitors enter the CAVE through the back wall, then see the virtual environment projected all around them. Since projectors are used instead of head-mounted displays, several people may enter the space at a single time.

Some the visualizations that will be shown in the CAVE will support stereoscopic viewing. One of the visitors at a time may

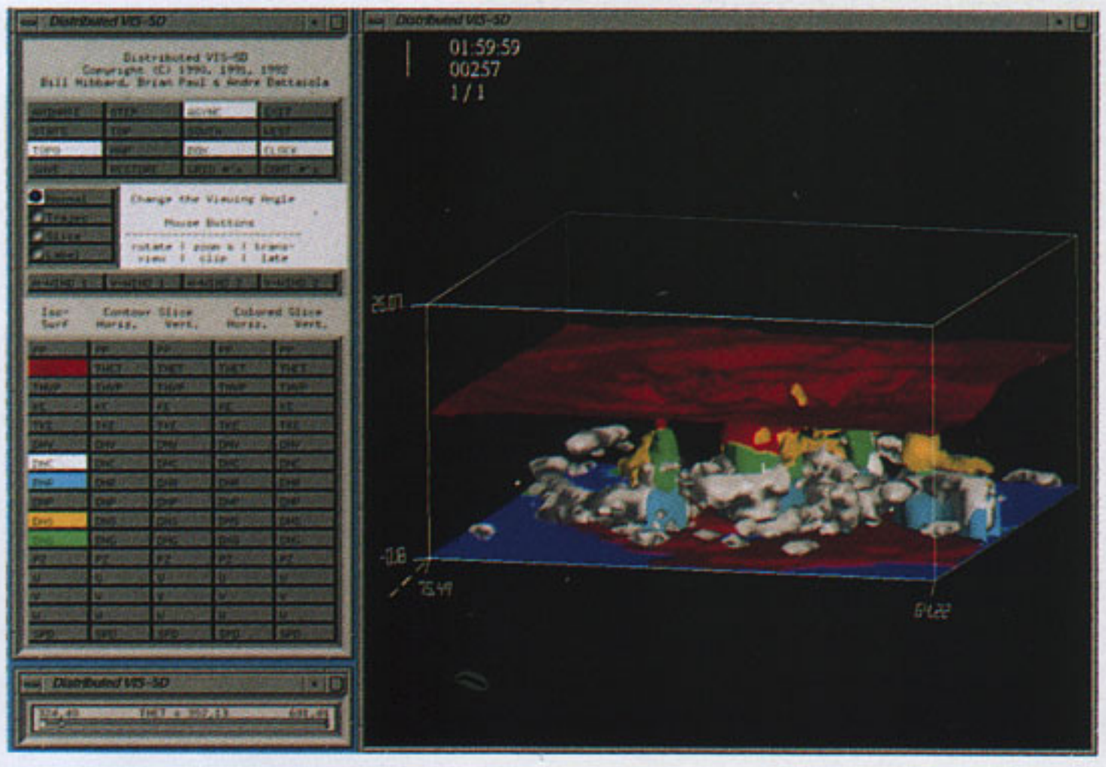


Pion Propagator with Isosurfaces

VISUALIZATION

put on a pair of StereoView liquid crystal shutter stereoscopic glasses with an attached tracking device. As the participant moves his or her head and walks toward or away from any of the screens, the applications will change the perspective of the stereo views to increase the sensation of actually being in the 3D space created with the data. Other visitors in the CAVE at the same time will also be able to experience the stereoscopic environment, but in a passive, rather than active, mode.

The CAVE and the other SHOWCASE '92 exhibits highlight Silicon Graphics' commitment to both visualization and Virtual Reality. Don't miss the new Silicon Graphics booth (Booths #915/922), our VR Showcase (with some of the latest applications of VR technologies) and the University of Illinois' SHOWCASE '92 at SIGGRAPH '92.



Joshua Mogal is a Product Manager for Silicon Graphics' Advanced Graphics Systems. Susan Tellep works with Silicon Graphics' Advanced Graphics Systems.

by Joshua Mogal and Susan Tellep

IRIS Indigo R4000

THE FASTEST APPLICATION SYSTEM ON THE DESKTOP

by Chris Surowiec

Silicon Graphics is pleased to announce the latest addition to the IRIS Indigo product family—offering even more application power in an additional line of flexible and upgradable configurations—the IRIS Indigo R4000.

CPU POWER

At the heart of these new workstations is the MIPS R4000—the world's fastest 64 bit microprocessor. Externally clocked at 50 MHz, the architecture employs superpipelining in which two instructions can be issued for each external clock rate of 100 MHz. The R4000 systems are completely compatible with the R3000A systems, enabling applications to gain tremendous performance benefits without requiring the user to recompile the software.

The IRIS Indigo R4000 tightly couples 1MB secondary cache with the R4000 processor. Running at comparable IRIS Crimson speeds (SPECint92 57, SPECfp92 61, SPECmarks89 70, MIPS 85, and MFLOP 16), the IRIS Indigo R4000 performs at up to three times the speed of the IRIS Indigo R3000. In the future, users will continue to see common graphics and CPU technology packaged into different chassis. The different chassis provide a range of graphics, memory, I/O and disk expansion based on specific application requirements.

GRAPHICS POWER

Entry graphics configurations will demonstrate up to twice the performance increase as a result of the faster CPU. Those applications that are currently compute-bound on IRIS Indigo XS, XS24 and Elan will also exhibit an overall application performance increase.

APPLICATION POWER

By adding the R4000 technology to IRIS Indigo, Silicon Graphics establishes a new standard for the application workstation. The extraordinary system balance between CPU, I/O, fast SCSI, graphics and integrated digital media technology, coupled with the addition of the R4000 processor, now provides IRIS users with the fastest application performance ever available in this level of machine.

AVAILABILITY

The R4000 will be available across the entire IRIS Indigo product family—from the IRIS Indigo Server to the Elan Graphics configuration. Additionally, a user-installable upgrade from IRIS Indigo products' R3000 to R4000 will be offered. Configurations will ship in the September 1992 time frame.

Chris Surowiec is Silicon Graphics' IRIS Indigo Product Marketing Manager.

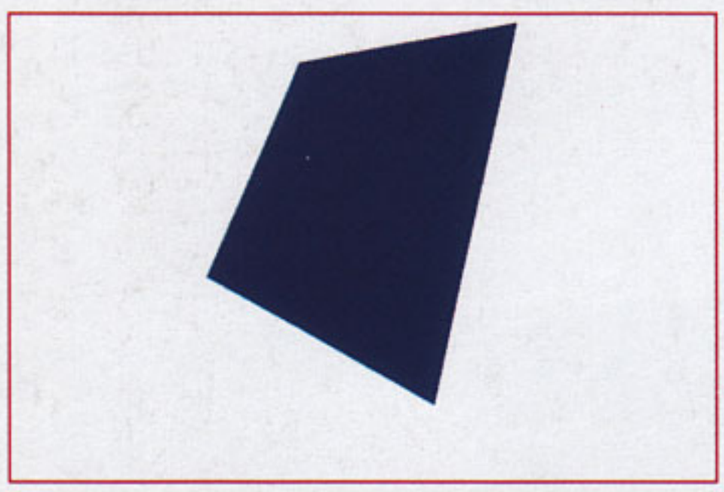
IT'S TIME TO GET REAL

AN INTRODUCTION TO THE REALITYENGINE

by Greg Estes and Joshua Mogal

A DECADE AGO a man had a vision. Jim Clark believed that a real-time computer graphics rendering system could be created that emulated reality so effectively that one could not tell the difference between looking out of a real window and looking out of a computer generated window. A decade later, we take the next step toward that goal.

This summer, Silicon Graphics cemented its two year lead in graphics visualization systems with the introduction of the RealityEngine. Demonstrated publicly at SIGGRAPH '92 for the first time, the RealityEngine combines the world's fastest graphics with exciting new features that will bring interactive, photo-realistic graphics and powerful image processing capabilities to users across the IRIS application spectrum. The RealityEngine is truly an application-oriented workstation, offering performance that is attainable in real applications—not just in benchmarks.

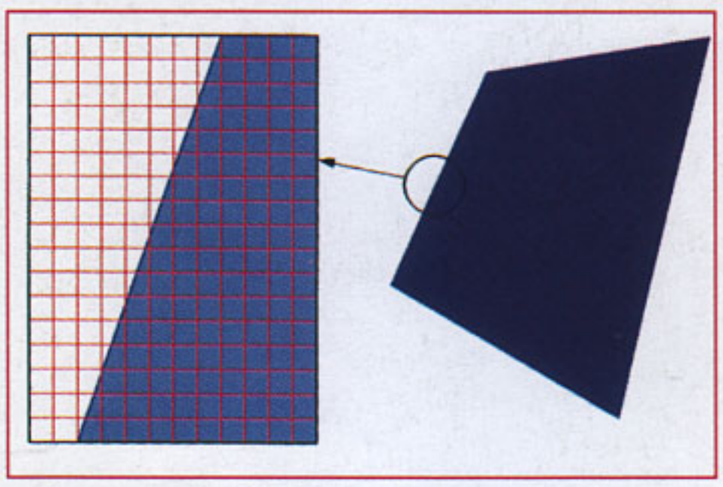


Polygon being rendered (shown with perfect, non-aliased edges).

A LITTLE HISTORY

While systems have existed for some time that provide visual simulation for the training of commercial and air force pilots, they have traditionally been large, expensive ($1M+) and strictly limited in the range of possible realities that they could display. Within the limited context of their use as training systems, however, they could create remarkably realistic computer generated scenery at thirty to sixty rendered frames per second.

The problem with these systems, however, lay both in their cost and inflexibility. The average scientist, engineer or architect rarely has either the space in which to place or the money with which to purchase such a machine, or the ability to utilize its capabilities within the context of his own applications, which may



Polygon overlaid with pixel raster.

or may not have anything to do with the rendering of realistic outside-world scenes. Scientists in different disciplines need to visualize both realistic and synthetic representation of their data, something not easily accomplished in a machine designed to render out-the-window scenes only.

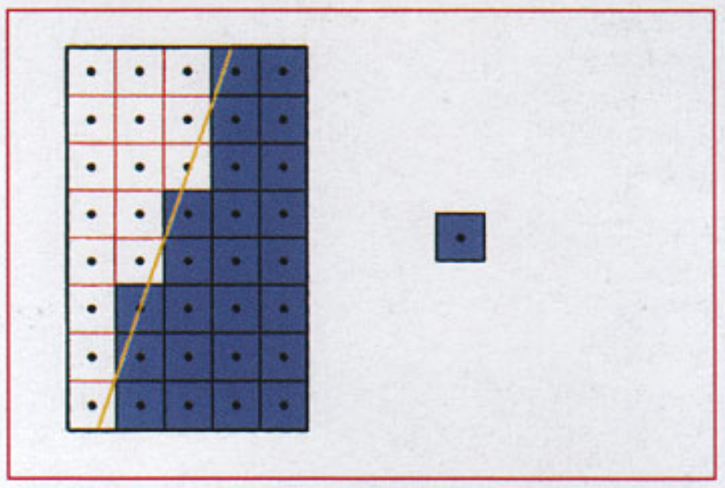
Geophysicists want to see revealed the structure of the Earth's mantle reconstructed from seismic soundings; the FAA would like to visualize atmospheric micro-bursts in real-time over a realistic rendering of Denver's Stapleton Airport to help route aircraft away from dangerous atmospheric phenomena; product designers want to see highly detailed part models with photo texturing, reflections and realistic lighting. All features are either marginally supported or not supported at all on most training-oriented visual systems.

Additionally, major port authorities would like to train harbor pilots to navigate huge tanker ships into harbors safely, and so desire a truly realistic outside-world simulation of the harbor, but they cannot afford the current, more expensive photo texturing image generators.

VISUALIZATION PEDIGREE

Through the IRIS Graphics Library (GL), Silicon Graphics has always provided a broad, flexible tool for performing general data visualization. Combined with the IRIS advanced hardware graphics workstations, like POWERVision (VGX/VGXT), the 4D POWER Series and graphics supercomputers have become the platform of choice for scientific visualization, research, engineering and low cost simulation.

The POWERVision super computers, first shipped in June of 1990, were the first general purpose graphics workstations to incorporate real-time texture mapping and image processing capabilities. Quickly adopted by those performing visualization and simulation and training, POWERVision started Silicon Graphics' move toward interactive realism.



Pixels whose centers are inside polygon edge get colored, creating a stair-stepping—or aliasing—effect.

TAKING THE NEXT STEP

Every two years, Silicon Graphics reinvents the high end of graphics visualization hardware. Starting with a clean slate—new printed circuit boards, custom VLSI sub-micron ASICs and microcode—a new system is developed that redefines what is possible in a real-time interactive graphics system. All the while, binary compatibility is maintained with previous generations of hardware to ensure that minimal to no software effort is required to move to the new graphics hardware.

The RealityEngine is a new graphics subsystem that is compatible with all IRIS Crimson, IRIS POWER Series and IRIS SkyWriter systems. Available in configurations of one to eight parallel RISC

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  - ☐ Lithography
- ☐ **Manufacturing**
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  - ☐ Automotive
  - ☐ Computing
  - ☐ Petroleum
  - ☐ Textiles
  - ☐ Other
- ☐ **Government**
  - ☐ Dept. of Defense
  - ☐ Dept. of Energy
  - ☐ Dept. of Trans.
  - ☐ Health
  - ☐ NASA
  - ☐ Other
- ☐ **Building/ Construction**
  - ☐ Architecture
  - ☐ Engineering
- ☐ **Research**
  - ☐ Chemistry
  - ☐ Geosciences
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  - ☐ Other Life Sciences
- ☐ **Computer Sftwre. Dev.**
- ☐ **Education**
- ☐ **Other**_____

My application interests are:

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- ☐ Architectural Design
- ☐ Artificial Intelligence
- ☐ CAE
- ☐ Finite Element Analysis
- ☐ Fluid Dynamics
- ☐ Image Processing
- ☐ Industrial Design
- ☐ Man/Machine Interface
- ☐ Mechanical CAD/CAM
- ☐ Mission Planning
- ☐ Molecular Modeling
- ☐ Pre-press
- ☐ Visual Simulation
- ☐ Robotics
- ☐ Scientific Visualization
- ☐ Other (Specify)_____

My IRIS workstation is a:

- ☐ Power Series
- ☐ 4D/GT
- ☐ 4D/G
- ☐ 1000/2000/3000
- ☐ Personal IRIS
- ☐ IRIS Indigo

The number of IRIS workstations at my site is:

- ☐ 1–5
- ☐ 6–10
- ☐ 11–20
- ☐ 21–50
- ☐ More than 50
- ☐ None

Software Utilized:

- ☐ Public Domain Software *(please specify)*
- ☐ Custom Software
- ☐ Third-Party Software

My job function is:

- ☐ Corporate Mgt.
- ☐ Marketing
- ☐ Consulting
- ☐ Engineering Mgt.
- ☐ Engineering Staff
- ☐ Creative Staff
- ☐ Research Staff
- ☐ Other_____

My organization's total sales volume or budget:

- ☐ Less than $100,000
- ☐ $101,000–$1 Billion
- ☐ More than $1 Billion

Number of employees at my company:

- ☐ Under 250
- ☐ 251–5000
- ☐ 5000 or more

I purchase or influence the purchase of the following graphics and imaging products:

- ☐ PCs
- ☐ Workstations
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- ☐ Networking products
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- ☐ Monitors/Displays
- ☐ Scanning/image capture devices
- ☐ Plotters
- ☐ Storage or memory devices
- ☐ Color Printers
- ☐ Laser Printers
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Do you use or own an SGI workstation? ☐ **Yes** ☐ **No**

If so, what is the serial number?_____

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- ☐ PowerVision Graphics
- ☐ Parallel Programming
- ☐ Mastering IRIX
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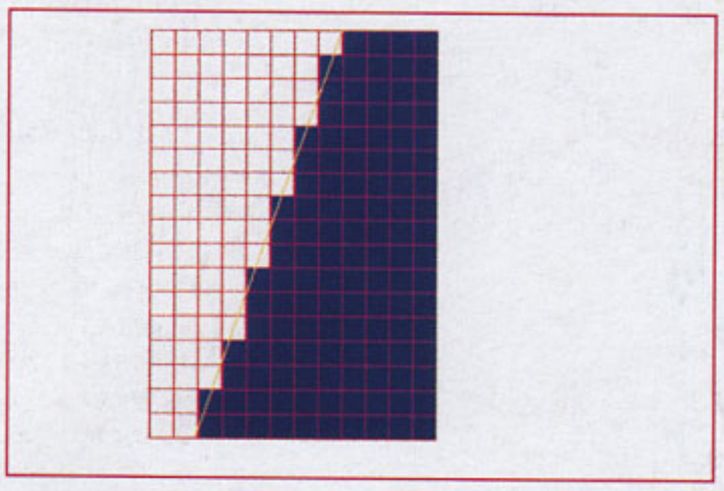
CPU's, or as an upgrade to installed GTX, VGX, VGXT, and SkyWriter systems, the RealityEngine offers the average application up to one order of magnitude increase in performance over existing graphics subsystems.



Subpixels inside polygon (four subpixels per pixel) are colored, showing finer resolution.

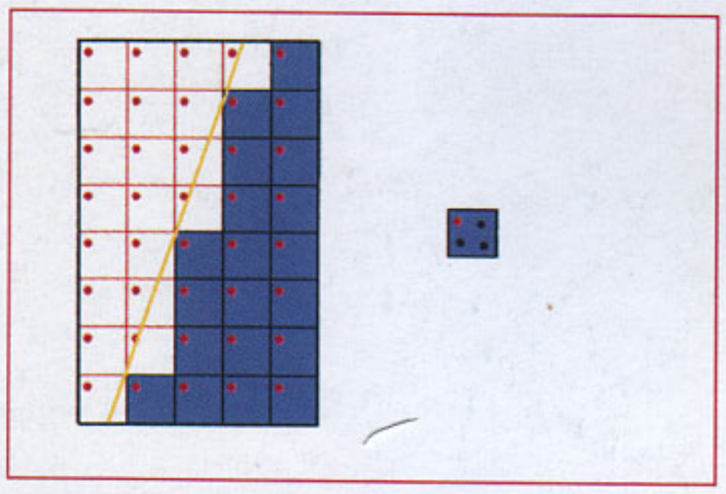
The RealityEngine was designed with several goals in mind: an evolutionary rather than revolutionary architecture; a premium on realism, scene complexity and image quality; and, an overall desire to enable users to take advantage of the entire range of system features (like texture mapping, full scene anti-aliasing, z-buffering, shading, etc.). All of this without having to sacrifice performance.

The result is a system that combines performance and features in ways that will enable users to take full advantage of the architecture without the performance loss normally associated with the use of advanced features or large polygonal complexity.

SYSTEM STRUCTURE

As ASICs become more compact and dense with circuitry, graphics subsystems are becoming comparably more compact. In 1988, Silicon Graphics introduced the GT graphics architecture as a five board set. This was followed in 1990 by the VGX (POWERVision) architecture that required only four boards for the base configuration, with an optional fifth board to improve system performance and capacity.

The four boards of the VGX (and VGXT) architecture included the Graphics Manager for handling data transfer between the CPU and the graphics subsystem, the Geometry Engine for performing all of the geometric operations (translations, scaling, rotations, lighting) and scan conversion, the Raster Manager for performing all of the pixel-oriented operations (i.e., setting and blending color and transparency, texture mapping, z-buffering, etc.) and finally the Display Generator that handles all of the video processing of the digital frame buffer to create the analog



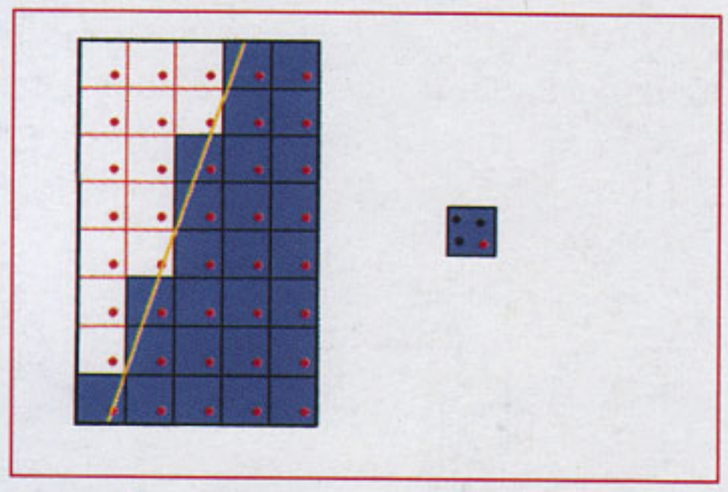
Using four subsamples per pixel—if subsample is inside of the edge, add one to count of subsamples hit per pixel.

video signal needed to drive the monitor. The fifth, optional, board is another Raster Manager board that doubles the pixel processing performance through the addition of more pixel processors and frame buffer memory.

The RealityEngine follows the same model, yet reduces the base board set once again to only three boards. In this new architecture, the Graphics Manager and Geometry Engine are combined onto a single board, while the number of Geometry Engines is increased to five from the four that were used in the VGX/VGXT. Additionally, the growth path for the RealityEngine has been extended significantly, as up to three additional Raster Manager boards may be added. A fully configured RealityEngine with four Raster Manager boards offers *quadruple* the pixel fill rate of a single Raster Manager RealityEngine system, as well as greater potential display resolution and antialiasing capabilities.

SKYWRITER TOO

With the new price/performance of the RealityEngine, the entire SkyWriter family of Host Integrated Computer Image Generators is being succeeded by a new SkyWriter family of systems, based upon the RealityEngine graphics subsystem. SkyWriter is targeted for the highest end



Repeat for subsample 2.

visual simulation applications, offering up to a six channel, high resolution dual-pipeline rack system.

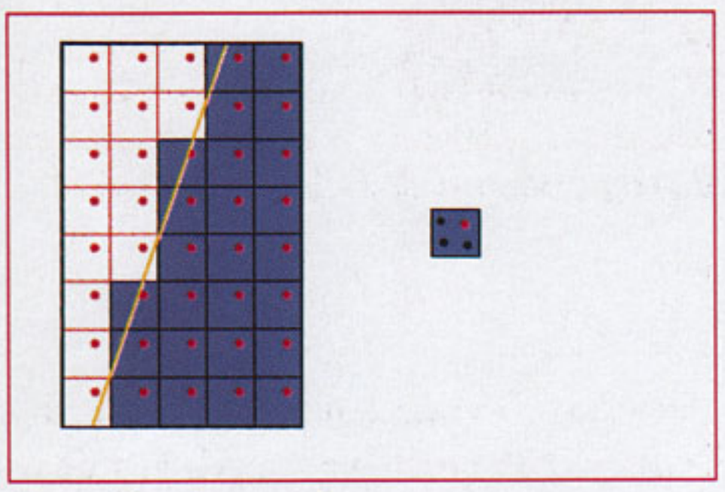
TEXTURE EVERYTHING

In keeping with the theme of interactive realism, the feature focus of the RealityEngine is towards both image realism and quality. On the realism side, the RealityEngine incorporates broad improvements in texture mapping capacity, capabilities, and performance. Following the VGX texture mapping lead, the RealityEngine incorporates texture mapping into the baseline performance, enabling everything to be textured while running the pipeline at full speed. The following list details the key elements of the RealityEngine texture mapping capabilities:

- 4MB of dedicated texture memory (regardless of number of Raster Managers),
- support for texture bit depths of 4 to 48 bits/texel,
- support for texture resolutions of up to 1024 x 1024,
- expanded texture filtering options like
  - bicubic interpolation,
  - unsharp masking,
  - detail textures,
  - trilinear mip-mapping (at full performance),
- support for 3D textures (each at reso-

lutions of up to 128 x 128 x 64),
- 100% compatibility with VGX/VGXT texture modes.

The 4MB of texture memory is made possible through the incorporation of the latest high density DRAM technology and represents almost thirty times the texture capacity of VGX/VGXT/SkyWriter systems. The texture memory is more flexible as well, as it offers the capability to increase the number of textures while reducing the bit-depth of those



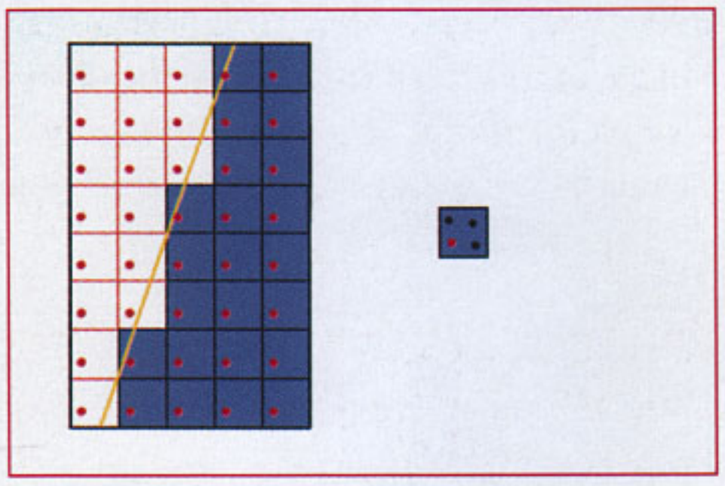
Repeat for subsample 3.

textures. Thus, while the system capacity supports 192 mip-mapped textures with 128 x 128 resolution and 8 bits/texel, one could double that to 384 textures if only 4 bits/texel were adequate.

The RealityEngine is also the first machine with built-in support for 3D mip-mapped textures. This capability offers new opportunities in real-time volume rendering within a mixed volume/polygonal visualization environment. As texture mapping has now become central to all of Silicon Graphics' high end visualization systems, the RealityEngine has taken the critical step to ensure that texture mapping does not impact the peak system performance.

NO MORE JAGGIES

The bane of applications trying to create accurate data visualizations always has been the "aliasing" effect. Raster graphics systems always have suffered from the artifacts created when the graphics system attempts to render a straight line on a non-90° angle into a regular gridded raster frame buffer. This illustration shows how a vector is represented by the pixels it touches. Since pixels can only be on or off, a stair-stepping approximation to the line is created, but it only somewhat resembles the original vector to be rendered.



Repeat for subsample 4.

If, however, subsamples of each pixel could turn either on or off, some pixels would have more subsamples on than others, thus modulating the color of each pixel based upon the number of subsamples touched, rather than just the pixel itself. This anti-aliasing technique is accomplished by providing extra anti-aliasing memory where the RealityEngine stores from four to sixteen subsamples per pixel (depending upon total resolution used and the number of Raster Manager boards). The RealityEngine renders scenes into the subsample memory, then filters the subsamples down to the actual screen resolution. This results in vectors and polygons that appear much more true to their intended form without the distracting jagged edges that normally affect the quality of the rendering.

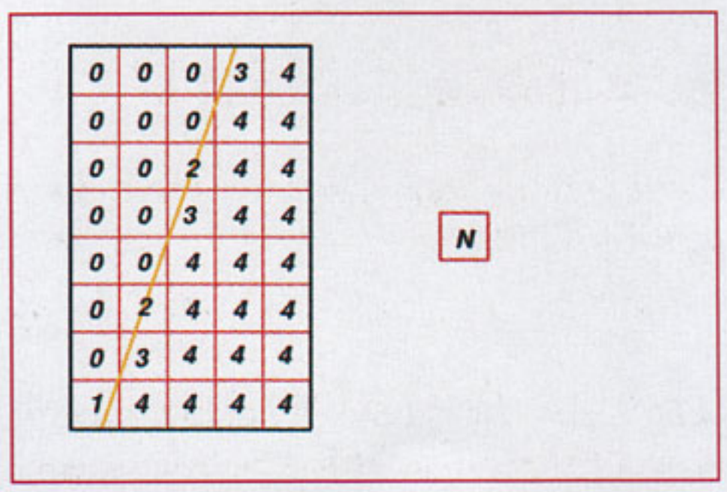
The RealityEngine has been designed from the beginning to handle full-scene antialiasing along with texture mapping, shading and z-buffering, with no performance degradation. Anti-aliasing is free.

OTHER FEATURES

In addition to anti-aliasing, the configurability of the frame buffer enables the use of a 32-bit z-buffer for highly accurate hidden surface removal. To ensure that intersecting faces have proper anti-aliasing along the false edge created by the intersection, the z-buffer is subsampled in the same manner as the image memory to ensure accuracy down to the subsample level. For image processing, the improvements in the frame buffer configurability offer 12-bit component color, providing greater color accuracy in each band of a scanned image.

VIDEO

As with the VGX and VGXT, the Reality-



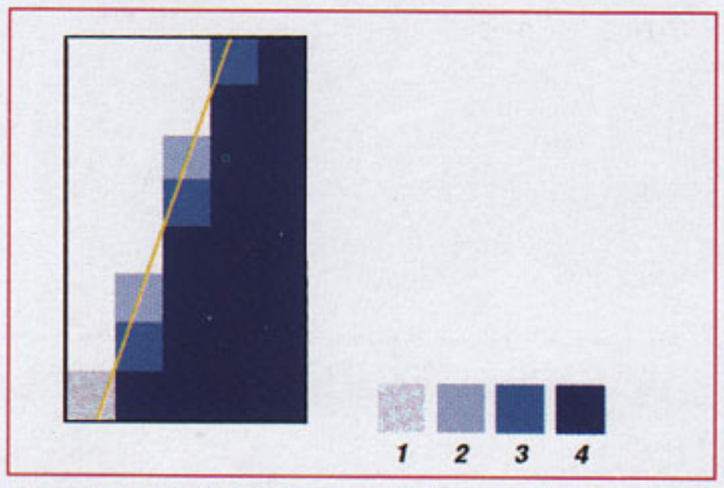
For each pixel, sum the number of subsamples hit.

Engine offers programmable video output to support any resolution from 640 x 512 all the way to 1600 x 1200 at 60Hz non-interlaced. In fact, the RealityEngine is the first real-time graphics system capable of driving this new 1600 x 1200 non-interlaced resolution with full color. Systems are delivered with a state-of-the-art 21" multisync monitor which supports any resolution up to 1600 x 1200.

For those involved in high definition film or video, there is a standard video support for HDTV (1920 x 1035 at 30Hz interlaced) with all of the necessary signals to drive an HDTV recorder or display (note that HDTV support requires a second Raster Manager board). Also included is support for higher refresh rates at the standard 1280 x 1024 high resolution output, such as those specified by many European countries with 72-76Hz monitor refresh requirements. Genlock and sync outputs are standard to enable the synchronization of the outputs of several machines.

Most exciting of all, however, is that the RealityEngine supports the output of

an RS-170 (PAL or NTSC component video) concurrent with the high resolution output. The user merely places a roaming RS-170 size frame around a designated portion of the screen and that area is output as a separate signal. A built-in NTSC encoder allows the direct attachment of video recording devices to capture the output of this roaming window without requiring the addition of any optional internal or external hardware.

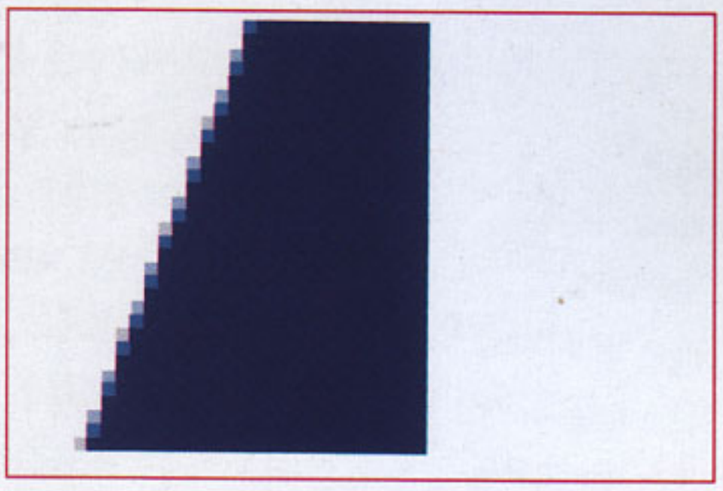


Use the sum of the hits per pixel to weight the color of each pixel rendered.

REAL PERFORMANCE

While previous graphics architectures offered advanced features and tremendous performance, the peak performance was usually restricted to certain rendering options that adhered to a tuned fast path. On the VGX and earlier architectures, this fast path included flat-shaded, triangle-meshed polygons that were not z-buffered, lit, textured or anti-aliased. Adding any of these options caused a corresponding reduction in performance.

The RealityEngine has been designed with a great deal of buffering to avoid a fast path and to offer performance improvements for all applications, regardless of the features they use.



Zooming out, a smoother edge is apparent.

REALISM IS ONLY ONE OF THE OPTIONS

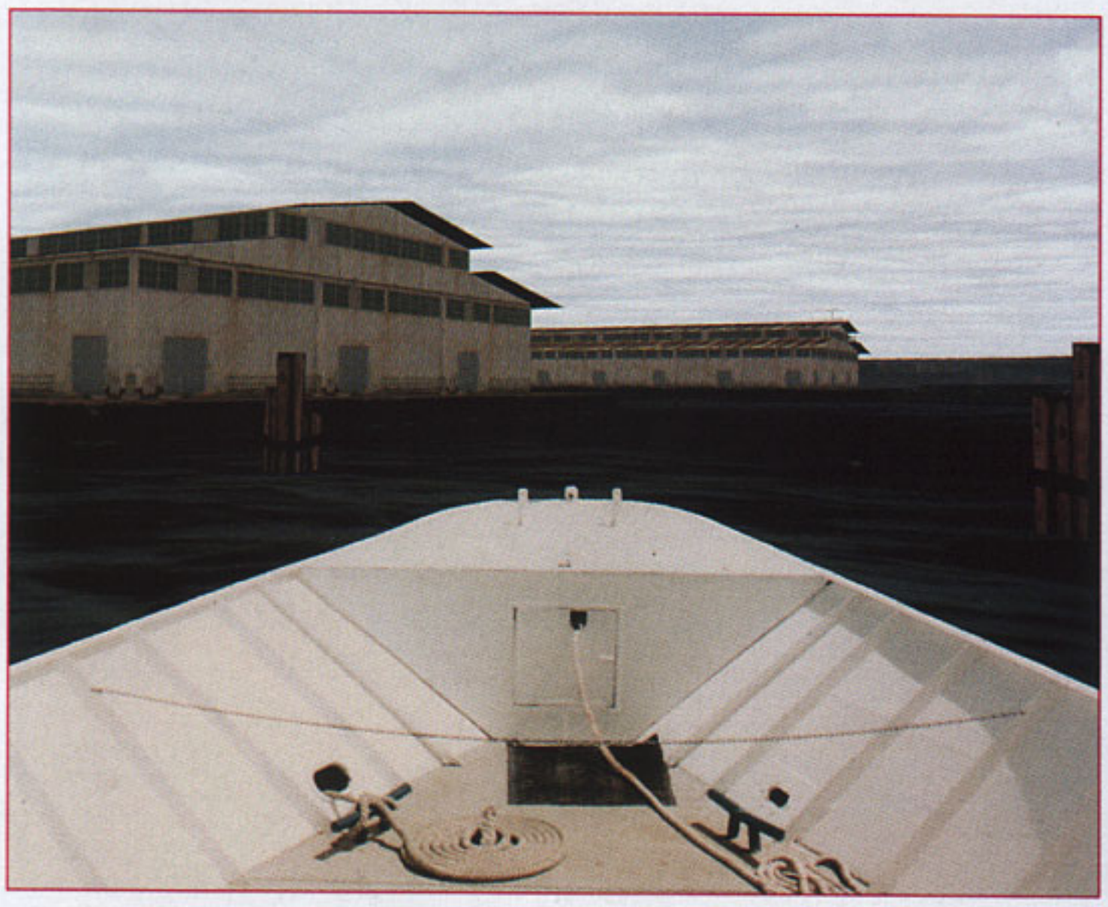
The texture mapping and anti-aliasing capabilities of the RealityEngine certainly can and will be used to create extremely realistic scenes for simulation and training, architecture, product design and virtual reality. The capabilities are generic, though, thus allowing users to create virtual realities and visualizations that do not and may not ever exist. In other words, the user is not limited to reality.

Zooming further out, edge aliasing is minimized.

The RealityEngine can render visualizations of abstract data, mixing video, image and volume processing and polygonal geometry all within a single environment.

The only limit is the imagination.

Greg Estes and Joshua Mogal work with Silicon Graphics' Advanced Graphics Division.



Harbor pilot simulation created by Paradigm Simulation Inc.

Desert scene by Hughes Training Inc.

The Crimson, Iris, Indigo, and Power Series just got better 1+2 3 4 5 6

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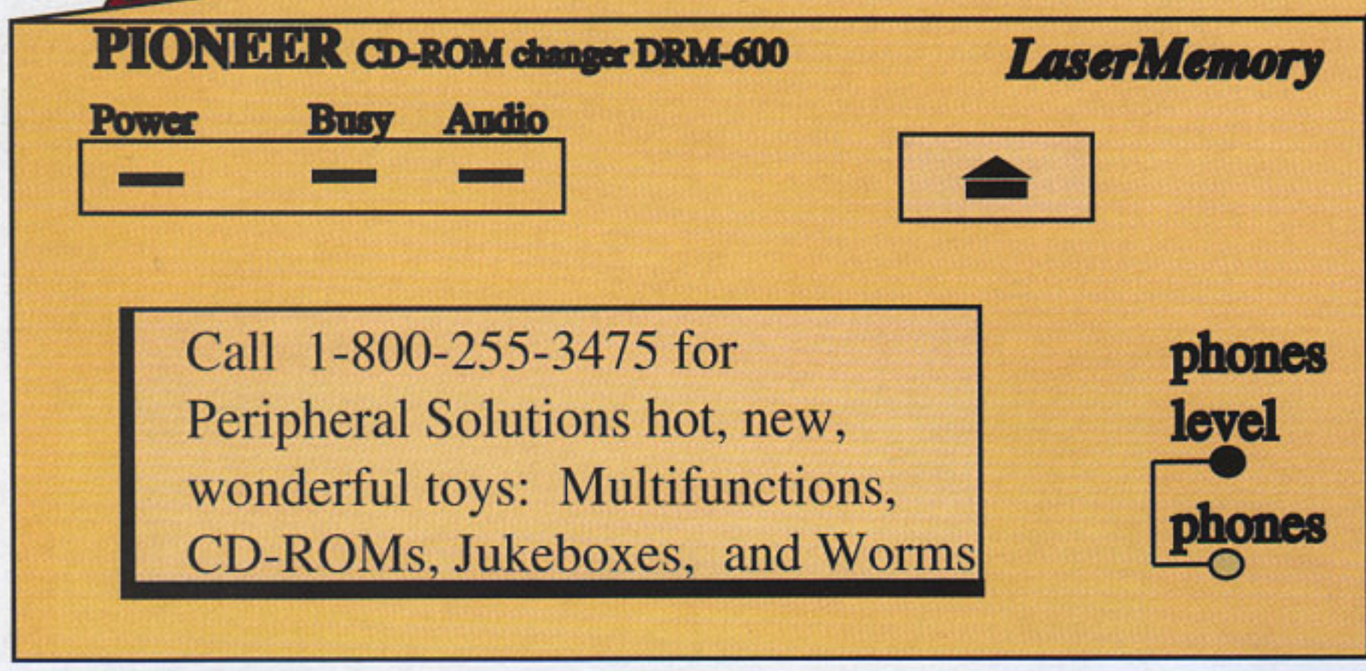

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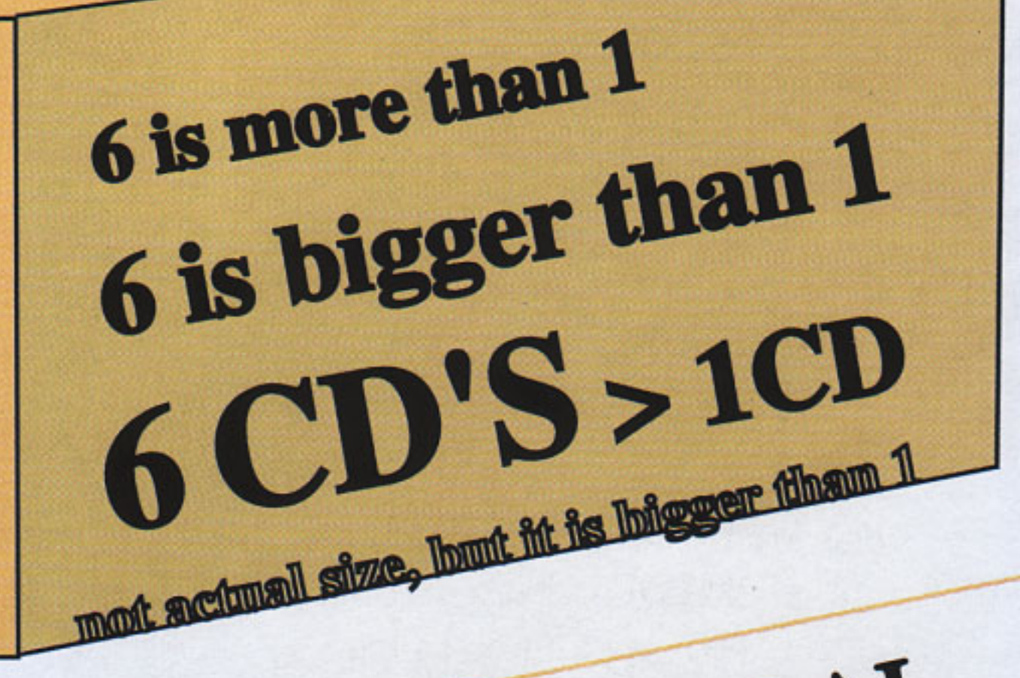

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Gareth Griffith and Nigel Hall joined forces in 1990 to establish Parallax Graphics Systems Ltd. Based in London, England, Parallax quickly has become one of the most intriguing players in the computer graphics/animation software arena.

The company's two key products, ACROBAT and MATADOR, run exclusively on Silicon Graphics platforms. The ACROBAT 3D animation system has flourished in Europe since its introduction two years ago. MATADOR, a 32-bit, 2D animation and paint package, debuted in June, 1991, and is currently in use at a number of production facilities in the U. S., including Industrial Light & Magic (ILM), Rez.n8 and Freezbyte.

Both ACROBAT and MATADOR integrate the processes involved in producing high quality graphics, consolidating functions that traditionally have been performed on discrete dedicated systems.

Although computers have been used for years to do single-frame animation, only lately has it become feasible to perform modeling, rendering, animation, compositing and special effects on a single workstation, and to reproduce these functions automatically on many frames. The accessibility and power of workstations, as compared to costly, dedicated video equipment, has opened up the market to many smaller operations. Instead of facing an enormous initial investment for an entire suite of dedicated systems, production companies these days can begin with just an IRIS Indigo, upgrading with more memory, processor boards and software as needs arise and resources permit.

by Crispin Littlehales

Parallax has been at the leading edge of this movement toward integration. Currently, its clients range from a video production group in London using a single 8-bit IRIS Indigo running ACROBAT, to California-based Industrial Light & Magic (ILM), which employs a network of POWER Series, Personal IRIS and IRIS Indigo workstations to create special effects that define the state of the art.

THE RIGHT STUFF

Parallax technology is the product of experience. The company has its own production group, and every one of its developers has a background in television production, film production, animation or graphic arts. And, Parallax engages its customers in the product development process by fine tuning each new release according to the requests of its commercial users.

In fact, after seeing MATADOR in action at SIGGRAPH last year, ILM road-tested the system for three months, discovering areas where performance could be improved to maximise productivity. Suggestions were incorporated into Parallax' next release, MATADOR 2.0. The software continues to evolve, with new features being added and existing ones enhanced in response to customer input.

Not surprisingly, the user interface also has been shaped according to user feedback. Common functions have been grouped together under a series of headings to simplify choices and enable users to get in, perform their most frequent functions and get out quickly. Menus are consistently organized and safety features that allow for several levels of "undo" have been incorporated. Equally important, unsuspecting animators are totally shielded from UNIX. And to see what they are doing, users of MATADOR can run real-time line-tests or fully rendered flipbook previews.

With such attention to interface design, Parallax has made it possible for most people with any design experience to get started on a project within hours of being introduced to MATADOR. Manuals, tutorials and training are available, but experience shows that the learning curve is modest.

STAY SEATED

MATADOR makes it possible to produce a complete animation sequence on a single IRIS workstation. Besides the convenience of never having to leave one's seat, this approach saves a significant amount of time. Users naturally evolve into jacks-of-all-trades, since so much can be accomplished on a single workstation.

In addition to its capabilities in video and film, MATADOR has much to offer graphic designers and color prepress pro-

fessionals frustrated by the limitations of a Macintosh. With the advent of the IRIS Indigo (priced comparably to a high-end Macintosh) there is now a viable alternative to programs like Photoshop. Since MATADOR was designed specifically for the IRIS Indigo, the interface utilizes the full power of this workstation, far exceeding the capabilities of even the most powerful Macintosh. Another plus is MATADOR's resolution independence. With enough memory, the program can handle large images of very high resolution and provide a broad array of retouching tools.

MATADOR 2.0: NO BULL

There are two components to MATADOR 2.0: MATADOR Paint and MATADOR Animation. Although each may be purchased separately, both programs were written to interact with one another. The paint program has special brushes to achieve painterly effects: the rub brush simulates brass rubbing; the drag brush blends colors and smudges edges; the diffuse brush creates an impressionist painting effect; while Smartbrushes automatically paints over a whole sequence of images, subtly varying color and texture with strokes that follow the contours of an image.

Shape creation tools enable the definition of vector shapes using polygon drawing, B-Splines and Cardinals, and freehand tracing. Vector text can be scaled, rotated, kerned and laid in perspective. All shapes, including text, can be added to the image or mask in any of the painting styles as solid characters or outlines, together with variable soft drop shadows.

In addition to being able to pan to any part of a high resolution image, users also can paint at sub-pixel resolution by zooming in—thus achieving a low-resolution image—but keeping the brushes at a high resolution. Filters provide for soft focusing, sharpening, image grain removal or addition, and a number of other effects like 3D bumping and refraction.

Masks can be generated for image protection, cutouts or layering. Using the paint tools, masks can be adjusted or retouched. An automatic suppression function prevents fringing, and a vector outline generator facilitates animation line-tests and the addition of glows. Tools to manipulate the cutouts allow animators to change cutout opacity, add a drop shadow, change dropout scale, rotate, warp or set the cutouts into perspective. Special treatments such as motion blur also can be incorporated.

MULTILAYERED ANIMATION

MATADOR's keyframe animator lets users create a multi-layered animation of any element they paint, cut out, scan in or build—all in a single pass. Layers can consist of live action, 3D animation, vector shapes, interpolations of cartoon characters, high resolution panning backgrounds or any paint macro. Unlimited layers can be edited in any order and inserts can be made at any time. The user can: animate the position, rotation and scale of layers along editable splines; add drop shadows and vary their softness as well as their position; animate the opacity to fade layers in and out; incorporate mask layers to move elements behind and in front of others; animate perspective placements for real 3D effects, and so on. There is even a function for interactive morphing.

AUTOMATION OF REPETITIVE OPERATIONS

MATADOR controls all popular VTRs and solid state video devices. The system disk can also be used to emulate a camcorder for film images. Grab and drop control is available through single button commands or keyboard shortcuts. MATADOR also has automation facilities that enable the user to develop macros to handle repetitive operations. In practice, this means that the software tackles the tedious chore of performing the same manipulation frame after frame after frame.

Imagine that an artist uses MATADOR to create an MTV style treatment of a dancer appearing over a variety of color-manipulated backgrounds with a halo-like aura surrounding the dancer. Instead of making the cutouts of the dancer by touching up the masks on each frame, the artist can use MATADOR's chroma-keying facilities to remove the background color, leaving a clean cutout. At the same time, a vector outline of the dancer can be produced. By recording a macro of the mask and cutout performed on the first frame, the artist can automate the entire process for subsequent frames in the sequence, saving all the cutouts to disk. By reducing repetitive work to single keystrokes, users typically realize time savings of more than ninety percent per frame.

Users also can create virtual switching networks with a hierarchy of channels through which complex routing operations can be initiated with a single selection. Channels can be triggered individually to load or save layers, or several can be linked together.

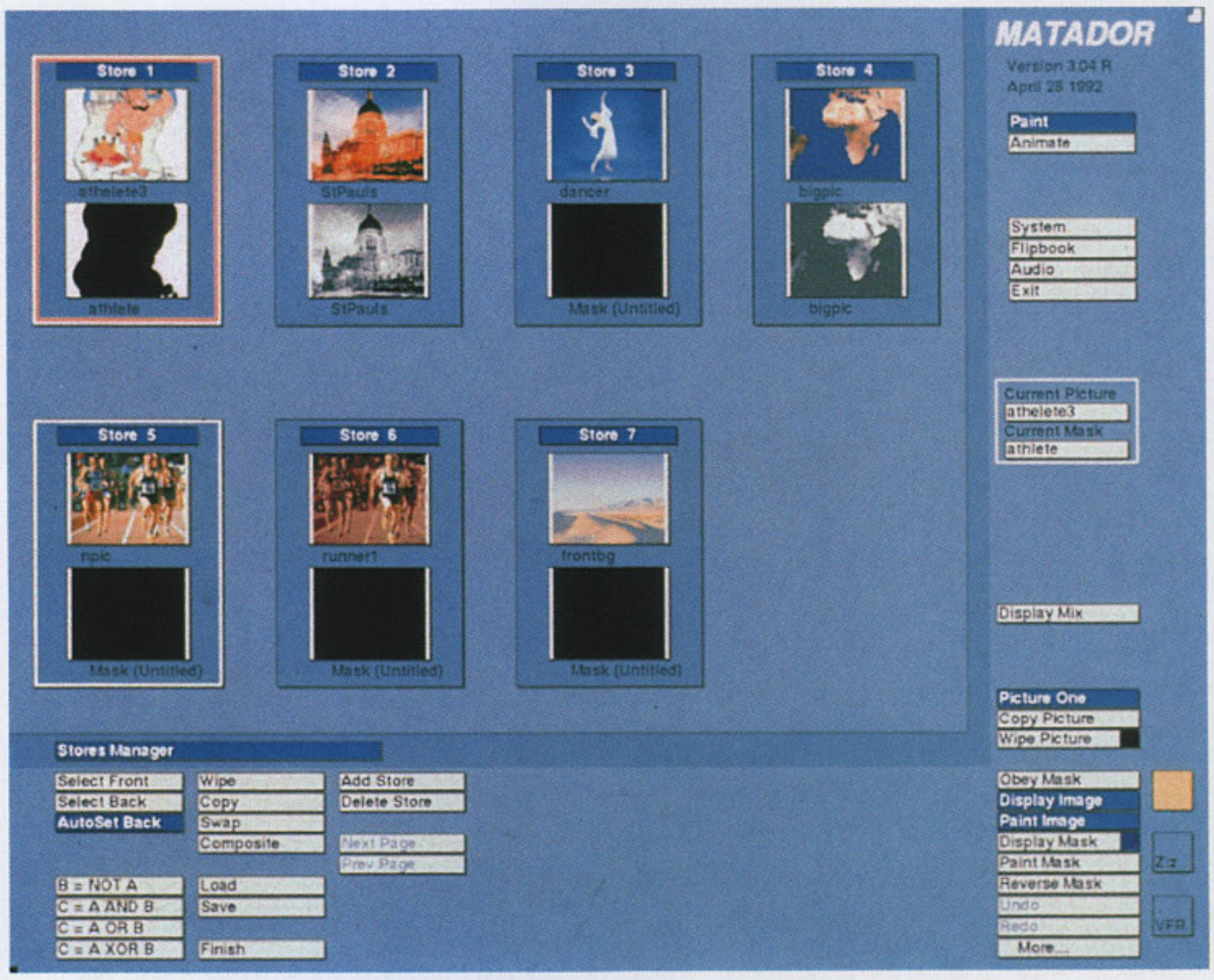
PROOF OF THE PUDDING

California-based Rez.n.8 used MATADOR to create an animation of the bobsled run for the recent Winter Olympics. ILM has just completed an impressive special effects animation for an upcoming feature movie. Oasis TV in the U.K. used MATADOR to produce broadcast sequences using 3D, live video and 2D animation. A new British children's television series made by Granada TV, scheduled to debut this autumn, has filmed twenty-six episodes using MATADOR and ACROBAT to create an artificial 3D environment over which the child actors are keyed in live action.

In today's economy, many companies are attempting to increase their business by expanding into different, but related, markets. The beginnings of this trend can be seen in the expansion of many video companies into the area of film. Moving from video to film requires a considerable increase in image size which is impractical on resolution dependent proprietary hardware. Since both MATADOR and ACROBAT are resolution independent, companies can escape this hardware trap.

Today, interactive morphing is the hot new thing. Tomorrow, who knows? What is certain is that the optical techniques used in traditional film are quickly giving way to computer image processing techniques that can be composited on a single system. This trend is definitely opening up new opportunities, and Parallax is poised to help users capitalize on them.

For more information contact: Nigel Hall, Director, Sales, Parallax Graphics Systems, 3 Soho St., London W1V 5FA. Tel: 071-287 3626. FAX: 071-494 2822



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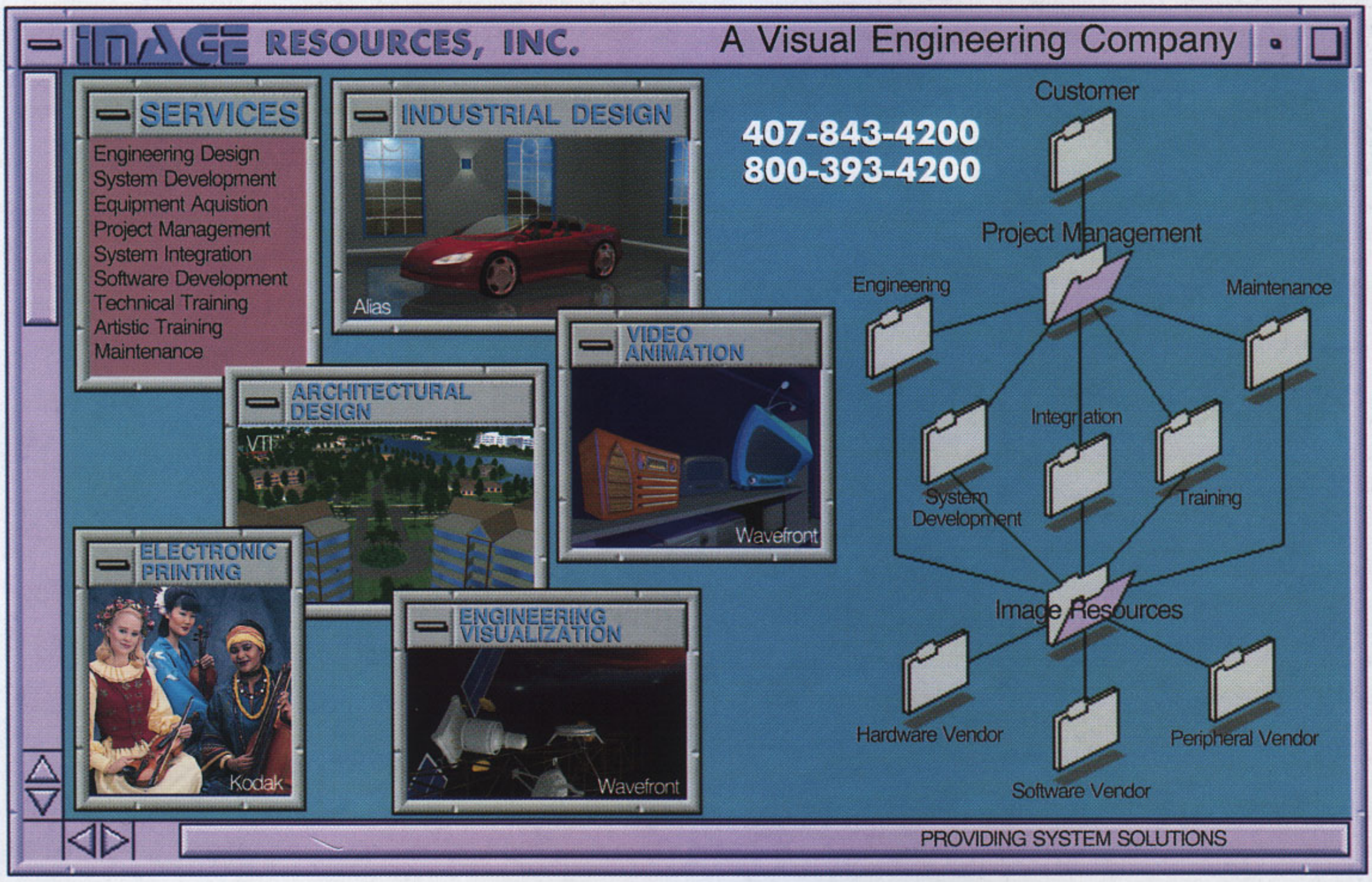

SAILING THROUGH

As the slicing bows of two low, sleek sailboats fill the screen, the graphics roll up like a sport car headlight. In it, a computerized image of the nearer boat, America^3 ("America cubed"), looms ahead and below, sails filled, a bright blue line trailing. Its Italian competitor, Il Moro di Venezia, sits further back and behind on a parallel course, trailing a bright red line. Suddenly, in a maneuver impossible for a plane or helicopter, the view swings in a mile-long arc to hover in front of both boats, so the trails of their interweaving tracks can be seen shrinking back toward a flat horizon.

"This is not a cartoon," says ESPN commentator Jim Kelly in his authoritative baritone. "This is three-dimensional computer graphics showing exactly what has happened in this leg."

Minutes later the graphics roll up again, this time displaying the two boats as 2D icons from directly above. Then it retreats to a God's-eye-view, again showing the intricate patterns of their competing paths toward a white dot—the mark to which they are racing. The red and blue lines make it obvious: America^3 has consistently forced Il Moro to the left where the wind is weaker. The stitched patterns document an exhausting duel; in a half hour the two boats have tacked, or changed direction upwind, twenty-seven times. Now America^3 is headed straight for the mark, ahead and moving faster. Two simulated speedometers on the left—knot meters to sailors—clock its small but definite lead in speed.

The crisp title at the top of each graphic: SailTrack. The credits at the right bottom: Trimble Navigation; Silicon Graphics. Kelly will mention the names more than once during the three hour race.

The event is the America's Cup, the oldest sports competition still going—and also the oldest technology-driven sports contest. A sailing yacht race that began in Britain in 1851 as a challenge for the Queen's Cup, it was first won by an American boat so rigorously designed that its builder pledged to refuse payment if it lost. It has remained in the U.S. ever since—except in 1983-87—pitting American boats against foreign challengers.

As sail power was eclipsed by faster transportation, the contest faded into obscurity—partly because the American boats always won (with more than a little help from the rules, written by the hosting New York Yacht Club), but also because it was a lousy spectator sport. Distant boats going five or ten miles per hour in one direction for half an hour could hardly compare to the excitement of an Indy 500 or the whites-of-their-eyes action of field and court sports.

Ironically, the America's Cup splashed back into the media spotlight when America lost in 1983; Australia II wrested the cup and the race from this hemisphere, stinging the nation's patriotic pride. What has kept it in the spotlight is technology, from Australia II's radical winged keel, cloaked in tantalizing secrecy until the race was over, to today's boats built of carbon fiber, first seen on military planes like the U.S. Air Force's Stealth fighter.

But technology also transformed television coverage—the key to marketing any sport today. In 1987, sports station ESPN augmented its photo boats, blimps, planes and helicopters with miniature cameras. Strapped to the base of the masts of the two finalists, Stars & Stripes and Kookaburra III, the cameras caught on-board action close up. For the first time, viewers heeled dizzily with the crews and observed their frantic cranking on "coffee grinders" to adjust huge sails.

This year's race, held off the coast of San Diego by the San Diego Yacht Club, again made a quantum leap in technology. This time Silicon Graphics was right in the middle of it. And ESPN was by no means the only broadcaster to use the power of IRIS workstations to enhance its coverage. Others were the Tokyo Broadcast System, TV New Zealand and Telemontecarlo in Italy. Except in New Zealand, each viewer saw animation provided by a Silicon Graphics production team.

Of all the projects enhanced by the power of IRIS computers, this had to be the most visible yet to a large, worldwide audience. And it drove home the fundamental tenet of Silicon Graphics: computers must have 3D real-time capability to display most powerfully their computational results.

Like many applications, SailTrack combines IRIS technology with other breakthrough technology to achieve its dramatic impact—in this case, the Global Positioning System or GPS, which is quickly becoming the navigation system of choice for marine vessels. Rapidly replacing tracking systems that read signals from ground-based radio transmitters, GPS picks up signals from several military navigational satellites. Built by the U.S. Department of Defense, GPS was used by allied forces during Operation Desert Storm.

Boats, or for that matter any vehicles using GPS, can pinpoint their position precisely anywhere on Earth, within the length of a football

AMERICA'S CUP COVERAGE

by Dale F. Mead

field, on a featureless 3000 mile sea or desert. Compare that to LORAN, whose signals from ground-based radio stations quickly become less reliable as a boat ventures further from land.

This was the first America's Cup where GPS was allowed, although in Fremantle teams used it to tune up their boats. Trimble Navigation, a Silicon Valley neighbor of Silicon Graphics with a similar history of rapid success, had been supplying navigation systems to Cup competitors since its LORAN units were used in 1980. As the supplier of choice for the World Cup in San Diego in May 1991, it was a natural to help ESPN track racers—as many as ten boats at a time during the March preliminaries—through live coverage beginning in April, down to the two-boat best-of-seven race finals that started May 9. A deal was struck last summer.

Initially, Trimble contracted to simply supply positional readouts on-screen in real-time for ESPN, with Hewlett-Packard providing computer support. But then HP dropped out, and the Silicon Valley connection had its opportunity. The area lies at the south end of spectacular San Francisco Bay, one of the premier sailing venues in the world; and not only Trimble, but Silicon Graphics employees Alan Trimble, Tim Heidmann, Forest Baskett and Dave Bagshaw are avid sailors—not to mention CEO Jim Clark, who owns a Baltic 55 sailboat.

"Mike Fisher (of Trimble) called Alan in October," Tim recalls. "We saw this as an opportunity to be ambitious, to apply 3D graphics." By January, the team had set up in San Diego and thrown itself into the project, working more than twenty-hour days, seven days a week for the first five weeks.

Project director, Alan Trimble, and lead engineer, Tim Heidmann, personally wrote software and installed the electronics on all the boats—eleven teams from eight nations. A significant exception was the under-funded Stars & Stripes, the boat of previous America's Cup champion Dennis Conner, which was supplied with a competing brand GPS unit, gratis. "It was the second time he lost the America's Cup without our equipment," jests Charlie Trimble, CEO, recalling Conner's loss to Australia II in 1983. This time Conner lost in the defender finals.

The racing teams used the high powered positioning data to test their own boats and refine their strategies and tactics during preparations.

The information also was transmitted back to land via a Motorola radio/modem communications link, to be used for a much more exacting task than safe passage; they would compare the paths of boats that often passed within inches of each other—and sometimes actually collided. So even the football field accuracy of normal GPS positioning proved insufficient.

Trimble improved performance tremendously for these races by installing a differential GPS station on the highlands of San Diego's Point Loma. Using the station as a control position, the system could better analyze the incoming sailboat readings and fine tune the position of each craft to one-third its length—and in some conditions, to within six feet. (Race crew navigators received and used the land station readings the same way.) Then the information was relayed every second to the International Broadcast Center, where the Silicon Graphics technical crew transformed it into a variety of 2D and 3D images of the action in real time.

For its glamorous name, the International Broadcast Center comprised a set of mobile trailer units in a parking lot. There, Silicon Graphics installed a network of twenty IRIS workstations to transform the digital data into vivid animated representations of what the boats were doing.

What the programmers gave ESPN and other commentators was far more than a series of position points. The images were enhanced with remarkable details, such as subtle, lighter blue patches on the water to support the appearance of the boats moving through it. As the boats switched to different sized sails on the course, the images changed with them. The image of each boat relative to its path had to be programmed, too, so that it did not appear to be sailing sideways.

Over an Ethernet network, ESPN's production incorporated a Silicon Graphics SailTrack producer right in the middle of the broadcast action, even though he was in a different building. As commentators Kelly, Peter Isler and boat-bound Gary Jobson took turns narrating, the ESPN program producer would call for a specific SailTrack image in five seconds. Working at his on-screen point-and-shoot console, the SailTrack producer would launch the image from the same viewpoint as the latest live shot of the boats, at the same instant Kelly cued the audience: "Let's take a look on SailTrack."

To pan around to a view from in front of the boats, for example, he would preset two on-screen sliders, one for compass angle, the other for height above the boats. Then on cue, he would trigger the program that swings the image smoothly around to its new viewpoint.

Once an image is on screen, the commentator can "draw" on it live for viewers, à la John Madden—to diagram quickly, for instance, what position the competitors are dueling to reach.

The applications were not limited to live coverage, either. The Silicon Graphics team also prepared segments for the Nautical Notebook—a crash course for viewers on the fine points of racing strategy and tactics—to be played at just the right moment in the action. One graphic shows quickly and simply why a small shift in wind direction can give one boat an overwhelming lead that no new amount of technology can overcome.

Applications, in fact, extended beyond enhancing the broadcasts. ESPN used the system for traffic control of its fleets on and over the water. And the race committee even used it to place marks (the temporary floats around which the boats race), which frequently must be repositioned during a race if the wind shifts.

In SailTrack, Silicon Graphics has handed ESPN a tool they never imagined when they signed the contract with Trimble Navigation less than a year ago. Suddenly they have at their command an "animation generator," as Heidmann calls it, that lets real action drive a kind of virtual reality.

Only after America^3 retained the Cup, however, could the ESPN production team begin to consider the potential of the medium. "We're doing research into other sports," says senior coordinating producer Jed Drake, who was calling the shots during the broadcasts.

Heidmann reveals a less restrained response behind the scenes. "Producers were going nuts," he reported. "This is going to be a big deal for broadcasters, for news events, sports and entertainment."

The whole SailTrack team is catching its breath over what it created. "It was a pretty big success," summarizes Silicon Graphics' Trimble. "A lot of people are more knowledgeable now about sailboat racing. They understand what the boats are doing out there."

As for the possibilities, he is a little overwhelmed. "We don't know what we're going to do," he adds. "We've started a whole new industry."

Dale Mead is an avid sailer and freelance writer based in Cupertino, California.

TRACKING SAILTRACK'S FUTURE

With the America's Cup over, after five hectic months getting "a new industry" on line, the SailTrack development team finally could indulge themselves in a glimpse at the future.

What they imagine surprises even them.

Tim Heidmann, Silicon Graphics' software developer for special projects, foresees a big impact on television broadcasting, in news events, entertainment and particularly sports. The America's Cup invited 3D imaging because "it was difficult to watch and difficult to cover."

Heidmann can see its use in air races, off-shore power boat races, the Itiderod dogsled race in Alaska, and even the premier bicycle race, the Tour de France. Further, baseball broadcasters probably could use 3D animation to show the track of a pitch, where pitches are clustering and how they are breaking.

"The Japanese want to use it in golf; they think the audience would be interested in the telemetry of the competitors," he says, "their heartbeat, breathing, that kind of thing."

Trimble Navigation CEO/president, Charles Trimble, quickly recognized its potential for navigation.

"It has real possibilities for providing commercial pilots with 3D views in inclement weather," he suggests. "And the U.S. Coast Guard could use it to keep track of commercial vessels."

Trimble, who had to sell his thirty-foot sailboat because "it went sailing more than I did", explains that his company offers a line of marine navigation products that display full National Oceanic and Atmospheric Administration (NOAA) charts.

"It would be nice to go from those charts to a 3D representation of what you're seeing," he says.

Trimble recalls sailing into San Francisco Bay from the ocean without an engine at midnight and trying to find his harbor in an adverse tide. The landscape looks much different at night than during the day, and an imaging program such as Silicon Graphics offers could depict the identifying channel and harbor lights on screen—from the boat's position.

"I would have loved to push a button to get a representation of the harbor," he suggests.

He feels the project helped his product considerably. GPS systems typically "average" their readings, and cover up occasional glitches. But SailTrack's real-time imaging required a constant flow of accurate data; so Trimble engineers had to refine certain algorithms. What they learned can now be applied to future designs.

Alan Trimble, director of special projects for Silicon Graphics, has been negotiating with ESPN and cannot disclose the plans. But he concurs with Heidmann's vision for other sports coverage, such as running and cycling.

"A lot of sports, like the America's Cup, are difficult to cover by conventional means," he explains—and those are the ones that could benefit most from the technology. "If we could wire up the competitors, we could chart their pace and their heart rates."

But Trimble is not sitting around playing what-if. He already has sent a programmer out with the Grateful Dead to unleash a live, interactive animation on the huge screens used in their concerts.

"We had the band members in here and scanned their heads in 3D," he says. "The programmer will be able to morph their images into one another." It adds a whole new dimension to the term "Dead-heads."

While this new project did not arise directly from SailTrack, "it's a consequence of doing real-time 3D graphics," he concludes.

More revealing, it signifies Silicon Graphics' new-found fascination with live entertainment on the small screen—even when it's on a big screen.

WAVEFRONT RELEASE

Wavefront Technologies Provides Silicon Graphics Customers Enhanced Desktop Visualization

Wavefront Technologies and Silicon Graphics began a joint development project in 1989 to provide desktop photo-realistic rendering for all Personal IRIS users. From August 1989 through June 1991, Silicon Graphics included an entry-level version of Wavefront's Personal Visualizer with each Personal IRIS. Many Silicon Graphics customers used Wavefront's Personal Visualizer to create photo-realistic images to visualize mechanical parts and assemblies, preview product designs, explore architectural concepts, develop product packaging ideas, and create compelling photo-realistic imagery for presentations.

With the introduction of the IRIX 4.0 operating systems and the new Indigo and Crimson workstations, existing distributed copies of the Personal Visualizer will not operate. Wavefront is providing Silicon Graphics customers a significantly enhanced new version of the Personal Visualizer, Version 2.4, which operates correctly under the IRIX 4.0.4 operating system as well as on Indigo and Crimson workstations. This enhanced Personal Visualizer operates with Silicon Graphics TG, XS24Z, ELAN, VGX, and VGXT graphics.

Until September 30, 1992, Wavefront is offering a special promotion to all Silicon Graphics customers who wish to acquire the new Personal Visualizer.

The Personal Visualizer, Version 2.4 includes:

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Silicon Graphics customers and existing Personal Visualizer users may license a fully configured version of the enhanced Personal Visualizer *for the special license price of $3000 US*. Orders must be received by September 30, 1992 to be considered under this program. To reserve your new copy of the Personal Visualizer or to inquire about additional product information, please contact your regional Wavefront office or call **1–800–545–WAVE**.

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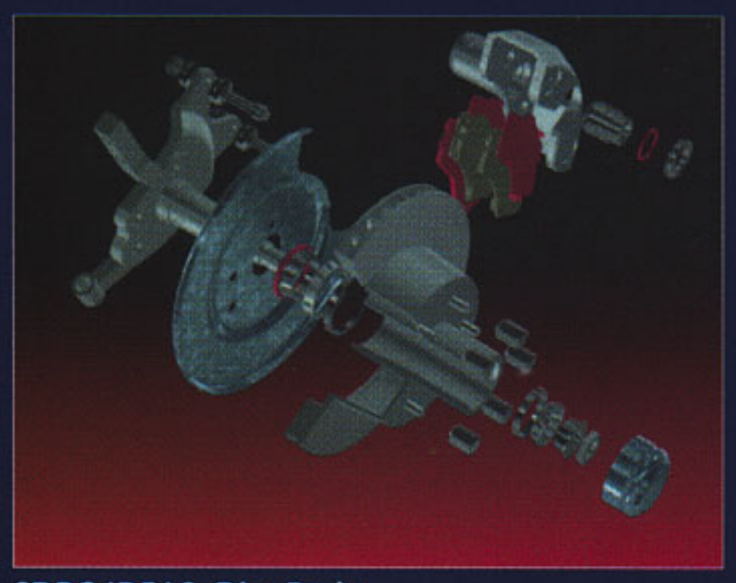

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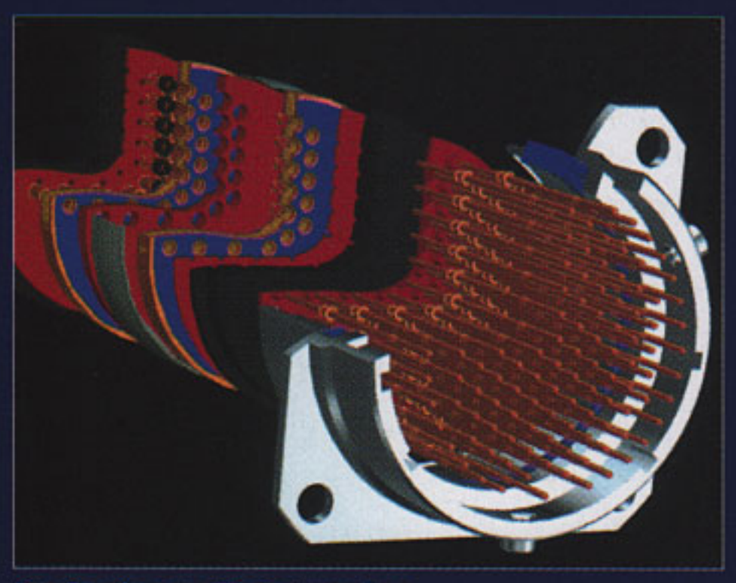

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CARTOONS FROM BELGIUM

BY JO MATTHIJS WITH STEPHANE CORTEEL AND BENOIT MICHEL

Image created by Little Big One

With every technological advance, animation moves another step away from the traditional, painstaking, cel-by-cel techniques and into the ever expanding opportunities of 3D, as well as 2D, computer animation. Today, animated productions enjoy worldwide popularity, and the European Economic Community (EEC) is particularly concerned about cashing in on the trend. In fact the EEC is encouraging cartoon animation companies to develop new ways to produce cartoons quickly and cost-competitively.

Two companies that have responded to the EEC's call to action, both located in Belgium, are Little Big One (LBO) and Neurones Cartoon. These companies have developed cartoon animation packages, each with a different focus. Little Big One's developmental emphasis is on the creation of 3D animated characters directly on the computer screen. In contrast, Neurones Cartoon's animation package starts with classically sketched cartoon characters that are then digitized to become three dimensional. Both approaches have their merits in different situations and both approaches rely on Silicon Graphics workstations to carry out their functions.

LITTLE BIG ONE

Little Big One specializes in the production of animation and video using computer generated images. Founded in 1987, the company has grown from twenty-four employees to seventy-seven and has increased its revenue from approximately five million dollars to eleven million dollars in 1991.

LBO focuses its activities on the design, production and post-production of video films, movies and pictures—still or animated—in 2D and 3D. The company's clients include television networks, private companies, public institutions and advertising agencies. LBO also designs, develops and distributes computer graphics software packages. These are used primarily for image composition and retouching, 3D object digitization, 3D animation, picture shooting and editing.

From the start, LBO developed software tools that suited the needs of its graphic artists. Today, LBO's ten-person Research and Development Department, composed mainly of computer science engineers, works in close collaboration with the Applied Mathematics Department of the University of Brussels and specializes in the design and development of high performance 2D and 3D graphic software applications.

LBO uses an extensive network of Silicon Graphics workstations, including: one 4D/25TG, 4D/70, 4D/310GTX, 4D/320VGX and 4D/340VGX; two 4D/20s; three 4D/25s; six IRIS Indigos and one IRIS Crimson. These workstations are used for 3D computer animation, 2D picture creation and retouching, and software development.

Three of LBO's products are available commercially through a network of distributors (270 licenses). LBO's best selling, as well as its first developed product, is Nefertiti—a professional, easy to learn, easy to use paint system that contains all the features required to create or modify computer images with a resolution of 4096x4096 pixels. It can be used as a stand-alone tool or as a powerful extension of various popular 3D animation packages, including WaveFront, Alias, SoftImage and TDI's Explore.

The paint system has two basic versions: Paint, especially designed for Explore users, and Easypaint, for SoftImage users. Nefertiti, the expanded version of the system, provides special brushes, polyline and spline editors, automatic mask generation using chrominance or luminance filters, enhanced cut and paste, and text functions such as deformation and perspective effect.

LBO's interactive 3D digitizing software is called Kheops. It enables graphic designers to easily create complex 3D objects. Using either 3Space or Polhemus' Isotrack digitizer, Kheops outputs files as input for 3D animation packages. Local editing functions include addition and deletion of points or edges, visualization under several view angles and instant shading. This software runs on Silicon Graphics workstations and is also available, although less powerful, for PCs running Microsoft Windows.

LBO's third commercial product is Khephren, a RAM recorder. This hardware board is designed for the VME bus of UNIX-based engineering workstations. It allows real time line tests of twenty-five pictures/second and dramatically reduces the recording time on a video tape.

In addition to its commercially available products, LBO has invented a proprietary cartoon package for its own internal use called 1-Toon-3. The result of a close collaboration between engineer Stephane Simal and animator Guionne Leroy, 1-Toon-3 was designed specifically to create animations of 3D characters by employing a user interface that allows a traditional animator to immediately interact with the computer without any help from a specialist in computer graphics. LBO's goal was to produce a tool that would, in effect, make the computer transparent to the artist.

With this package, animators trained in traditional cartooning methods on paper can build their cartoons directly on the system. The software program simulates classical animation, even providing a system interface—unique in 3D animation—that produces special tables to describe an animation and its different layers.

1-Toon-3 operates in five different phases. The modeling phase allows the animator to create the basic volumes needed to build characters. In addition, the modeler also can be used to specify the deformation of objects during an animation. In the design phase, the animator assembles the basic volumes to build a character, using only a mouse and a button box. (It is not necessary to enter numeric data on a keyboard.)

The animation phase supplies the cartoonists with the right tools to give life to the characters. Animation is based on key positions specified by the animator, who also can use special deformation boxes to twist, stretch or fold a character—or any part of a character. This deformation of a character creates the exaggerated physical actions seen in classical cartoons. Additionally, 1-Toon-3 allows the animator to integrate an animation into live action view—the live picture related to every key position in the background of the animation window.

To check the timing of an animation, it is essential to see it in real time. But the complexity of today's animations is such that viewing real-time animation is almost impossible, even on the more powerful 3D stations. In the line-test phase, by coupling 1-Toon-3 with Khephren (a specific electronic board that simulates a video recorder), up to twenty-four seconds of real time animation can be stored quickly in the board and then played back in real time. This allows the animator to continuously monitor his animation on the board-connected screen while editing it on the computer screen. When a project requires the integration of live action into animation, the animator can immediately visualize the results of the integration on the line-test screen.

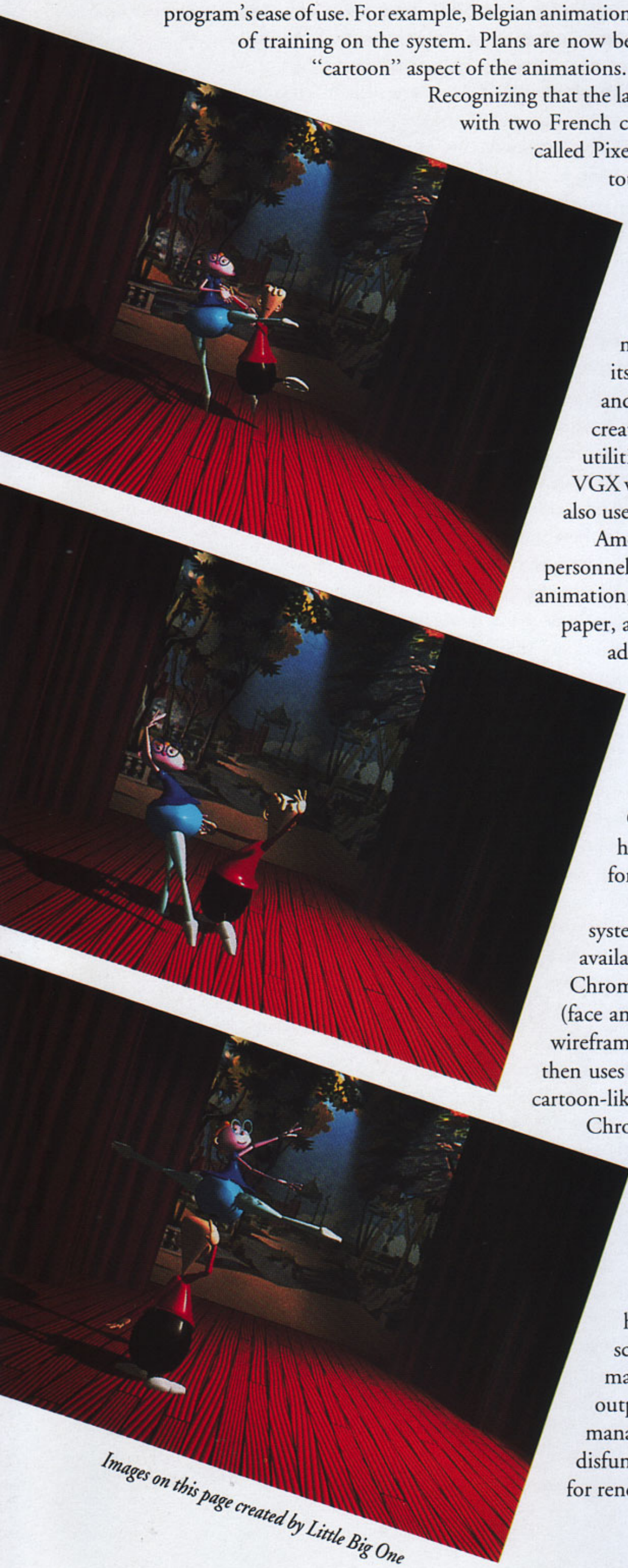
The last phase of production is the rendering phase, in which the colors, material and textural make up and the illumination of characters is determined. 1-Toon-3, interfaced with Renderman, makes it possible for the computer to perform this function automatically.

The success of 1-Toon-3 can be seen not only in the finished cartoons, but in the

Image by Neurones Cartoon

program's ease of use. For example, Belgian animation students were able to produce their first animations after only one day of training on the system. Plans are now being developed to enhance the current package by emphasizing the "cartoon" aspect of the animations.

Recognizing that the largest part of the animation market is still 2D, LBO, in collaboration with two French companies,Pixibox and TDI, is developing a 2D animation project called Pixel Industry. This project, larger in scope than 1-Toon-3, proposes a totally integrated production system for animation companies and emphasizes the industrial aspects of the production of an animation series.



Images on this page created by Little Big One

NEURONES CARTOON

Neurones Cartoon was originally a Belgian software development company named, simply, Neurones. After developing Chromos, its first 3D modeling system, the company added Cartoon to its name and, in 1991, became a cartoon production company. Neurones Cartoon creates its animation using Wavefront and Pygma (a proprietary set of utilities) running on Silicon Graphics workstations that include one 340 VGX with 128 MB and two 4D/35GTs with 40 MB. The VGX computer is also used for texture mapping and remote control of the VTR.

Among the twenty people employed at Neurones Cartoon are graphics personnel who use Chromos for drawing and also to build the 3D models for animation, traditional animators with cartoon backgrounds who still work on paper, and a 3D animator who uses software like Wavefront and Pygma. In addition, four people continue to work on new software developments and improvements for existing packages.

Neurones Cartoon has developed three major software packages—Chromos, Pygma and Hercule—that are currently being used for internal use only. The company plans to begin marketing Hercule 1.0 in September 1992 and then to launch Chromos 2.0 in the first quarter of 1993. Pygma, their newest product, has been used within the company since March and no date has been set for its commercial release.

Chromos, Neurones Cartoon's first package, is a 3D modeling system that presently runs on a Macintosh platform and soon will be available on the IRIS workstation. Based on the use of paper and pencil, Chromos is an original method by which the user draws two wireframe views (face and side) of an object. The software converts the 2D views into a 3D wireframe object, computes the object's surfaces based on the 3D curves and then uses that information to create the object's skin. This method produces cartoon-like results that greatly resemble the original style of the cartoon's creator. Chromos generates output for Renderman, Wavefront ASCII and binary, STL (3D-Systems stereolithography) and DXF 3D formats.

Hercule functions as a production line manager designed especially for computer graphic cartoons and works with various software programs including Chromos, Wavefront and Explore. Using ORACLE as its database engine, Hercule follows every information file handled during the fabrication process and automatically handles the rendering, the VTR recording and the backup. Interactive screens on networked Silicon Graphics workstations or Macintoshes make it possible for animators to exercise decision making control, and outputs are generated by sending SQL requests to ORACLE. The database manager also creates listings on the screen or a printer for such notations as disfunctions, work orders for modeling or graphics and animation lists ready for rendering or shooting.

Pygma is actually a connection of utility programs that work as a complement to Wavefront in order to increase the software's productivity. By creating hierarchies, classifying within families, pasting and handling, Pygma organizes the animation of characters more easily than using Wavefront alone. A character's actions and postures can be saved, recovered and then applied to another character within the same family. Additionally, Pygma can generate very accurate and realistic lip synchronization automatically by using the dialog sound file and the ASCII text file. The dialog sound file is digitized on a Silicon Graphics IRIS Indigo. Used together, Pygma's fast animation and Hercule's management capabilities maximize the amount of animation produced per week while minimizing management problems and resultant delays.

Neurones Cartoon is now working on its first television cartoon series. "The Lone Cuke" is a full 3D animation series (52 x 6 minutes) and will be available in several different languages, including French and English. This project is being developed with CSM, a French producer. Another animated project now underway is "The Bugs."

COMPUTERIZATION: KEY TO THE FUTURE OF EUROPEAN ANIMATION

While there is a large demand for cartoon programs in the European community (12,000 hours of animation over forty television networks), there are relatively few hours of animation that are totally created and produced in Europe (60 hours in 1986, 200 hours in 1987 and 350 hours in 1989). Although there is a tradition of high quality animation in Europe—and especially in Belgium—it is simply cheaper to send animation to the Far East for coloring and drawing. Because the European hourly rate for such work is the equivalent of up to one-hundred hours of work in Korea or Taiwan, it is not economically feasible to produce animation competitively in Europe using classical techniques.

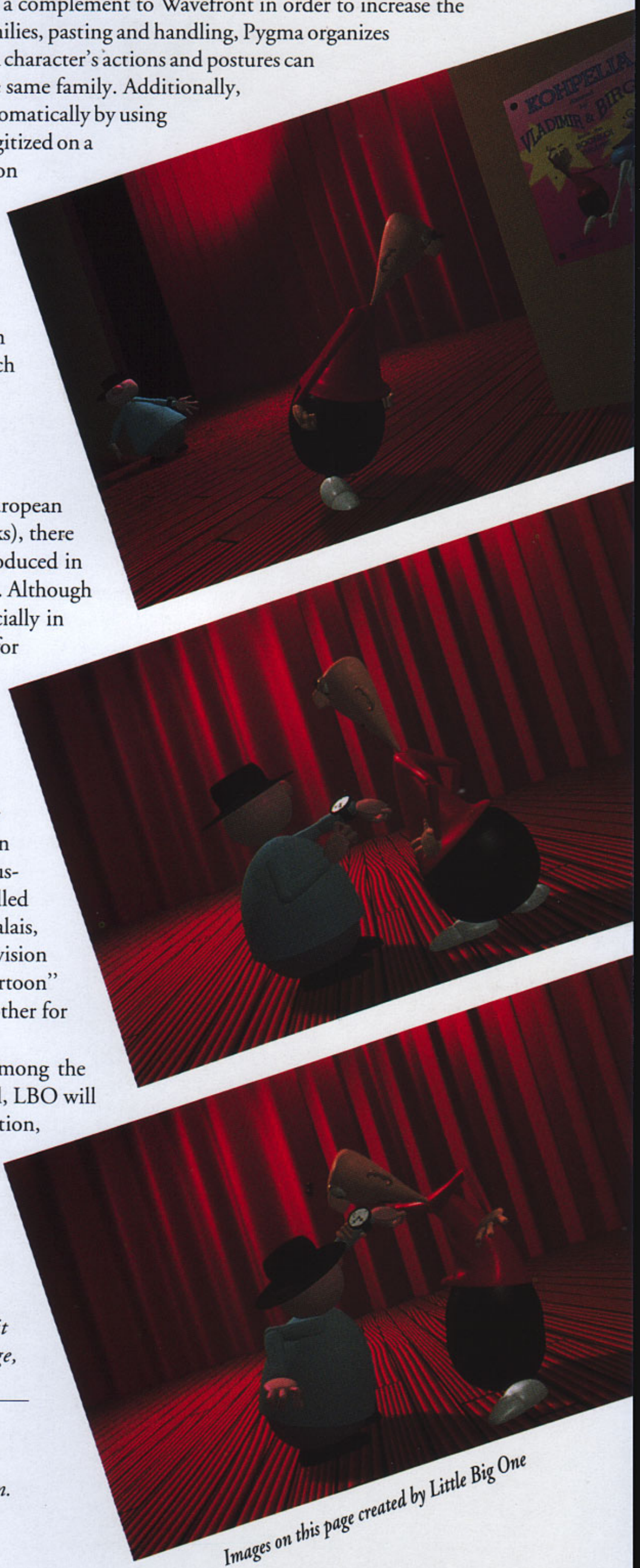
The most logical way to compete against the low cost of Asian manpower is to develop an animation industry based on computer technology that facilitates the production of high quality cartoon animation very rapidly. To promote the development of such an industry, the European Economic Community has developed a program called "Cartoon." EEC has scheduled a major meeting for September in Calais, France, to be attended by representatives of all the European television companies and by the producers of animation projects selected by "Cartoon" during the year. At that time, pilot projects will compete with each other for future funding by the EEC.

Little Big One's collaborative 2D project, Pixel Industry, is among the projects selected for the competition. If successful with their proposal, LBO will proceed with their development plans. Neurones Cartoon's animation, "The Bugs," has also been chosen by the EEC and will compete for series funding.

For more information regarding LBO, please contact Stephane Corteel, LBO, Avenue Ariane 12, 1200 Bruxelles, Belgium tel: 011 32 2 773 48 69.

For more information regarding Neurones Cartoon, please contact Benoit Michel, Neurones Cartoon, Quai Van Beneden 3, 4020 Liege, Belgium tel: 011 32 2 44 28 00.

Jo Matthijs represents Silicon Graphics in Bruxelles, Belgium.
Stephane Corteel is R&D Manager for LBO in Bruxelles, Belgium.
Benoit Michel is R&D Manager for Neurones Cartoon in Liege, Belgium.



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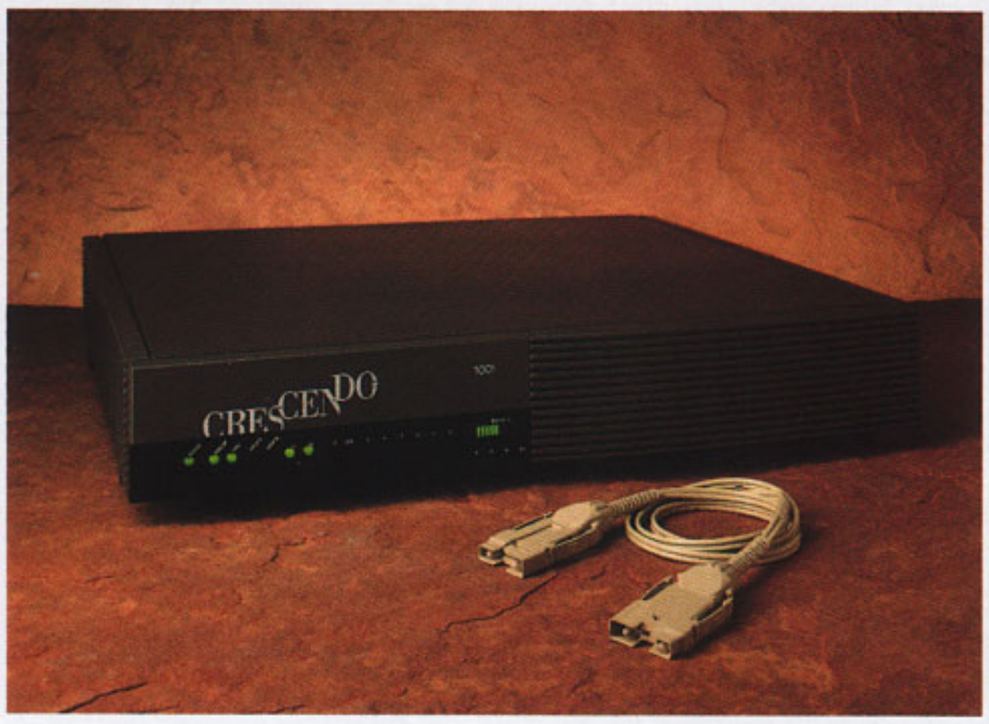

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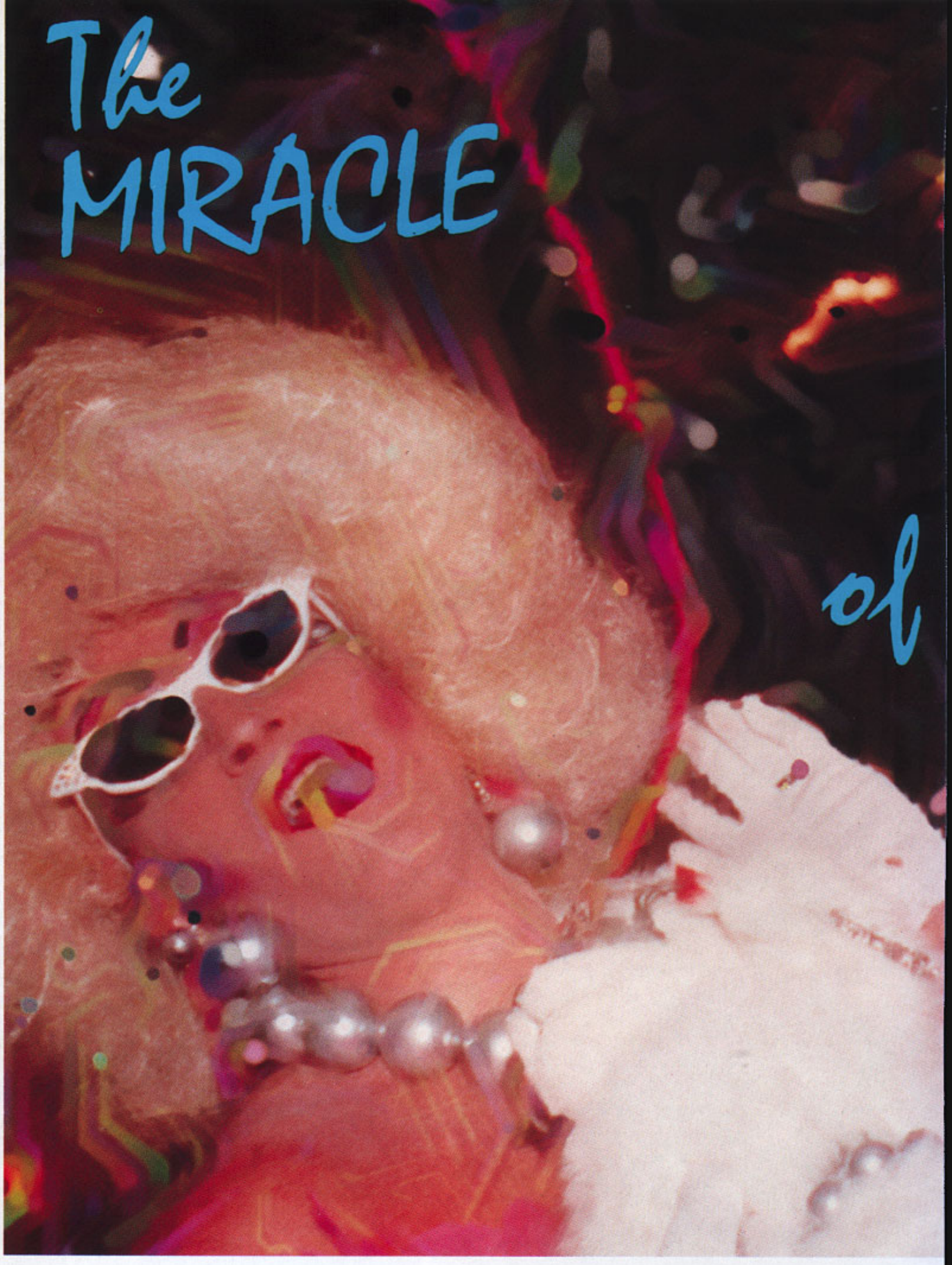


Computer animation has always amazed me, but it has always seemed just out of reach. The beauty and precision of it is compelling, but the complexity and effort involved is daunting. Also, I always felt that the tools and methods of computer animation were not well suited to my approach as an artist. I like an organic look and I rely on serendipity and intuition to guide me. I have never felt comfortable with the computer as an artistic tool.

This was before I walked through the door at Xaos Tools (pronounced "chaos"), and discovered Pandemonium. I had heard that Xaos Tools was about to release a new product, and some animator friends of mine told me that it was bound to be hot, so I made a call and asked for an interview. I set up a date, and they told me to bring a slide.

I found my way to the XAOS offices in San Francisco's Contract Design Center, and walked into a huge room with eighteen foot ceilings. Several people were working at IRIS Indigo workstations at one end of the room, and a painting studio was set up at the other. Two large canvases were in progress on the wall, and several five foot high carved letters were being painted with bright, primary colors.

An art studio at a software company?

"We're working on our trade show booth," explained Arthur Schwartzberg, President of Xaos Tools. "The letters make up the XAOS logo, and the canvases serve as the walls of the booth." This was not your typical hacker's den.

Schwartzberg asked me if I had remembered to bring a slide. I gave him a picture that I had taken of a pond at Point Reyes. He handed off the slide, and motioned for me to sit down. "We're going to scan in your picture, and then you can experiment with it using Pandemonium," he said. By now I was more than a little curious about this product.

"Pandemonium is the ultimate effects and animation tool," said Schwartzberg. "This is the product that is really going to put Xaos Tools on the map. Using Pandemonium, you can bring in any slide, video clip—really any kind of still or moving image you might have—and create a beautiful animation. You can also create animations from scratch, with no source image. The Pandemonium Effects let you create paint effects, swirling colors, ripples, warps, fireworks—all kinds of special effects. The Pandemonium Utilities make it very easy to perform routine operations, such as cropping, resizing, and color correction that used to be time consuming and difficult when you are working with animations of several hundred frames."

Matt Brocchini, Director of Product Development, walked over and said that my slide had been scanned. "Let's unleash a little Pandemonium on your lily pads," he said. We sat down at an IRIS Indigo Elan, and he brought up the software. He gave me a quick tour through the program's pull-down menus, showing me how to load my image and choose an Effect or Utility, and then he let me take over.

When you choose an Effect in Pandemonium, an array of buttons, sliders and other controls pop up to let you tune the Effect. Starting with the familiar, I selected the Blur Effect. This presented me with a slider for blurriness, and other controls for the length of the Effect. I set the length to three seconds, and then I clicked on a button to the right of the blurriness slider. This brought up a tool that let me control how the blurriness would change over time. I set the blurriness to zero at the beginning of the Effect, and thirty at the end.

I selected Start Preview from the pull-down menus. Another window popped up on the screen, and I could see a small version of my picture getting steadily more blurred. The images were being processed one by one and displayed on the screen. Once all the images were processed (a minute or so later), I clicked on the Play button and watched my three second animation.

I was ready for more interesting stuff. Over the next forty-five minutes, I experimented with the Posterize, Swirl and a few of the Paint Effects. One frame from an animation that I made using the Paint Nouveau Effect is shown on the next page. In motion, the brush strokes seen in the picture slid across the the pond and around the lily pads in the most delicate way. I was able to control the speed of the strokes, their size and the amount of color change as they slid along. Control is the key—each Effect is really dozens of effects, because the controls let the user change the appearance completely.

Before long, I had almost forgotten that I was working on a computer. The menus gave me the flexibility and control I thought were only available with a paint brush and canvas, and the speed allowed for an uninterrupted creative process. When I expressed these views to Brocchini, he smiled and said, "That is exactly what we are after, a tool for the artist, not the computer genius."

Celeste Webster is a San Francisco-based freelance writer.

ART + SCIENCE = PANDEMONIUM

by Matt Brocchini,
Director of Product Development

For some time we at Xaos Tools have struggled with the question of how to deliver the capabilities of our image processing technology to other users. The technology is very powerful, but it is also very complex. It takes many months of concentrated effort for skilled animators to even begin to understand the possibilities. It is a difficult challenge: make the technology easy to use, without sacrificing its power.

Pandemonium is our answer to that challenge.

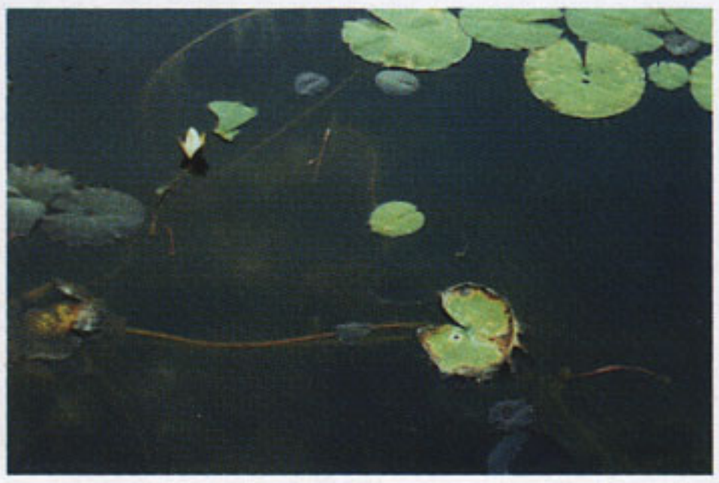
The technology behind Pandemonium breaks down into three main parts. At the heart of Pandemonium is Improc, which is a huge body of image processing routines that we have been building for four years. Improc contains hundreds of routines, including code for filtering, color correction, compositing, reformatting, automatic painting, shading, warping particle systems and more.

The second key technological element is Threads, our object-oriented scripting language. Threads provides very flexible and precise control of the Improc Effects, binding Improc into a whole that is much greater than the sum of its parts. Every Effect in Pandemonium is really a Threads script. Using Threads, XAOS animators can combine the various Improc functions into new, complex Effects that are truly amazing. The quality of the Pandemonium Effects is a tribute both to the technology behind them and to the abilities of the animators who designed the Effects.

The third element is OOTS, our object-oriented user interface tool system. OOTS allows us to easily produce a graphical user interface for each Effect. This way, we can give users control of the Effects without subjecting them to the complexities of Improc. A Pandemonium user who wants to make ripples move across an image does not have to know about channel forces, height channels, warping, or shading—he just needs to know how many ripples there should be, where they should start, how fast they should move and how quickly they should fade.

So this is the structure of Pandemonium: our animators created the utilities and Effects by writing Threads scripts which control Improc. Using OOTS, we gave each Utility and Effect a simple user interface. The Pandemonium application provides a framework in which the user can bring in imagery, pick and tailor an Effect, preview the Effect in real time and then send the output to the right place.

by Celeste Webster



The top image is the original water lily slide supplied by the author. The following images were produced using the Paint Noveau Effect, the Impressionist Effect, and the Posterize script (in descending order).

The image at center top depicts Digital Fireworks that were created using Pandemonium. The image beneath it shows the same Fireworks composited onto the sunset image, also using Pandemonium.

NUMBER TWENTY-ONE/IRIS Universe

IRIS Universe/NUMBER TWENTY-ONE

The first four images transition between the original picture of the girls by Holger Leue and the picture of straw. The last two images were created by using the same Warp Effect at different settings.

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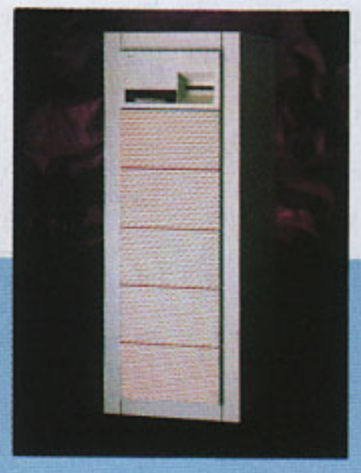

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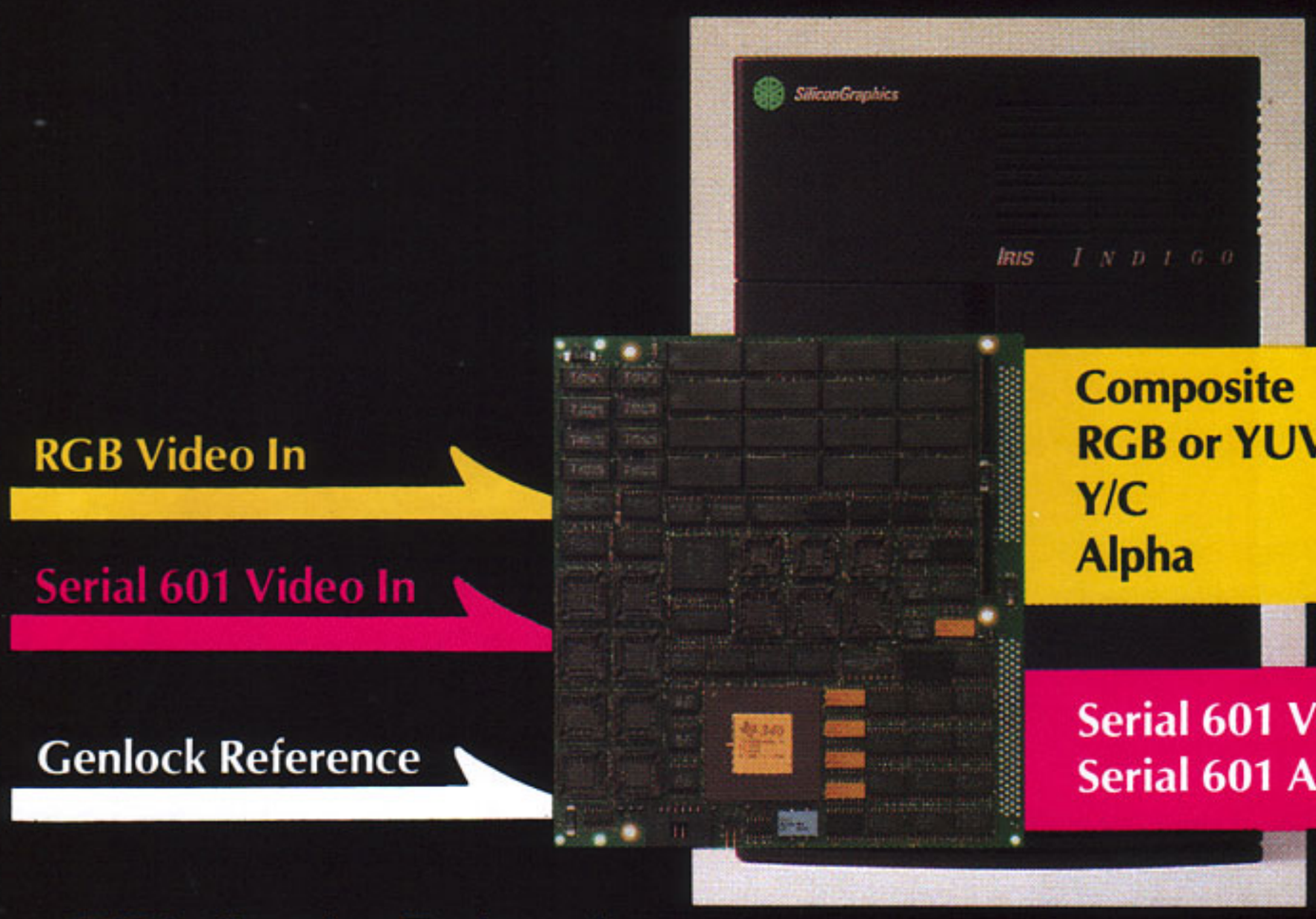

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FROM KETCHUP TO

by Maxine Cook

For United Glass, a leading U.K.-based manufacturer of bottles and other glass products, a virtual glass container design that can be placed on a virtual grocery store shelf is virtually worth its weight in gold. Using Silicon Graphics workstations to take clients' ideas, translate them into color visuals, including detailed labeling and realistic contents, and then output the result as a photographic-quality print or video, United Glass can show clients just how their future products will look.

In fact, the design team at United Glass can even "test market" their designs by placing containers into a variety of scenes where such products might be found in real life. Thus, it is possible for clients to assess the viability of different designs against competitive products in authentic situations—and all in a matter of hours.

United Glass' new visualization system is pre-programmed with a menu of twenty realistic scenes into which bottles and other glass products can be placed for presentation purposes. The scenes are typical locations such as a pub interior, a supermarket display and a family kitchen.

WHISKEY

The design team can edit the scenes by moving lights for creative effects, zooming into different areas to change view angles, and applying specific labels and identities to bottles and other glass products. Using a custom menu, designers can choose from a full range of glass colors and transparencies, as well as select from a variety of bottle contents ranging from ketchup to whiskey.

United Glass' new system is among the most advanced of the visualizing facilities available today. Designed by Communication Arts, a design consultancy located in Surrey, England, the United Glass configuration is based on their own in-house installation consisting of eighteen Silicon Graphics workstations, including the latest high performance VGXT, two Personal IRISes and fifteen IRIS Indigos.

A variety of software programs are available. For example, designers can use I/DEAS, SDRC's CAD/CAM package, to create extremely accurate models of new glass products. With Wavefront Advanced Visualizer, users can render bottle designs to photorealistic quality, complete with computer generated labels. If necessary, users can use a Sharp Flatbed scanner to import external imagery. A combination of Wavefront Visualizer Paint and Full Color Publisher from Alias Full Color make detailed retouching work possible as well as facilitating page design and make-up. By using Wavefront's Video Composer, the designers can transform visualizations into animation sequences, complete with titles and special effects.

The group uses three peripherals to handle different output needs and an IRIS SmartJet to produce photographic quality, high resolution images. Additionally, the group uses a Tektronix thermal wax printer to output drafts and a Hewlett-Packard HP7600 Electrostatic plotter to print drawings.

The end result of United Glass' investment in equipment and software is early product testing and time-to-market, thus affording a significant competitive advantage to both United Glass and their clients—the sort of advantage that is so often the deciding factor for success in today's business climate.

For further information, contact Jan Glaser at Communication Arts, telephone: 0784 471444, fax: 0784 471496.

Maxine Cook is a freelance writer in Egham, Surrey, England.

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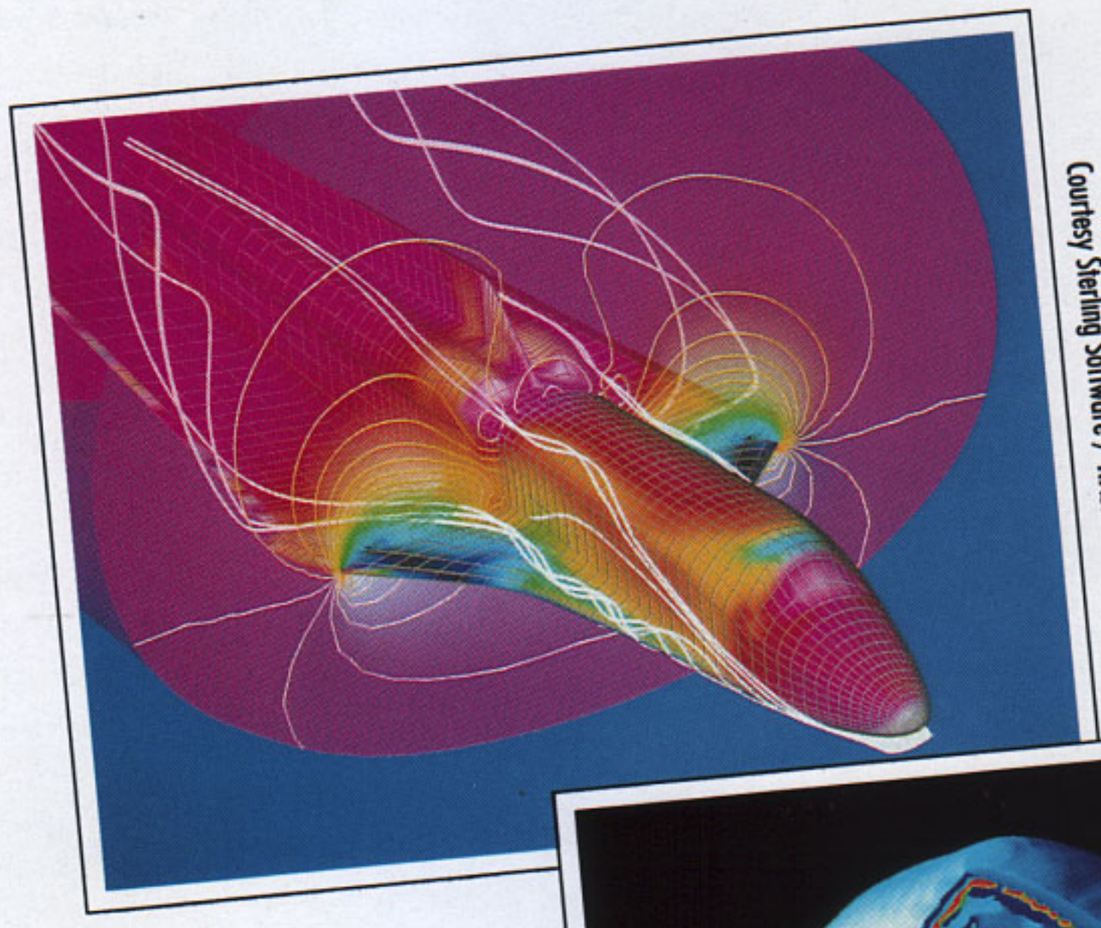
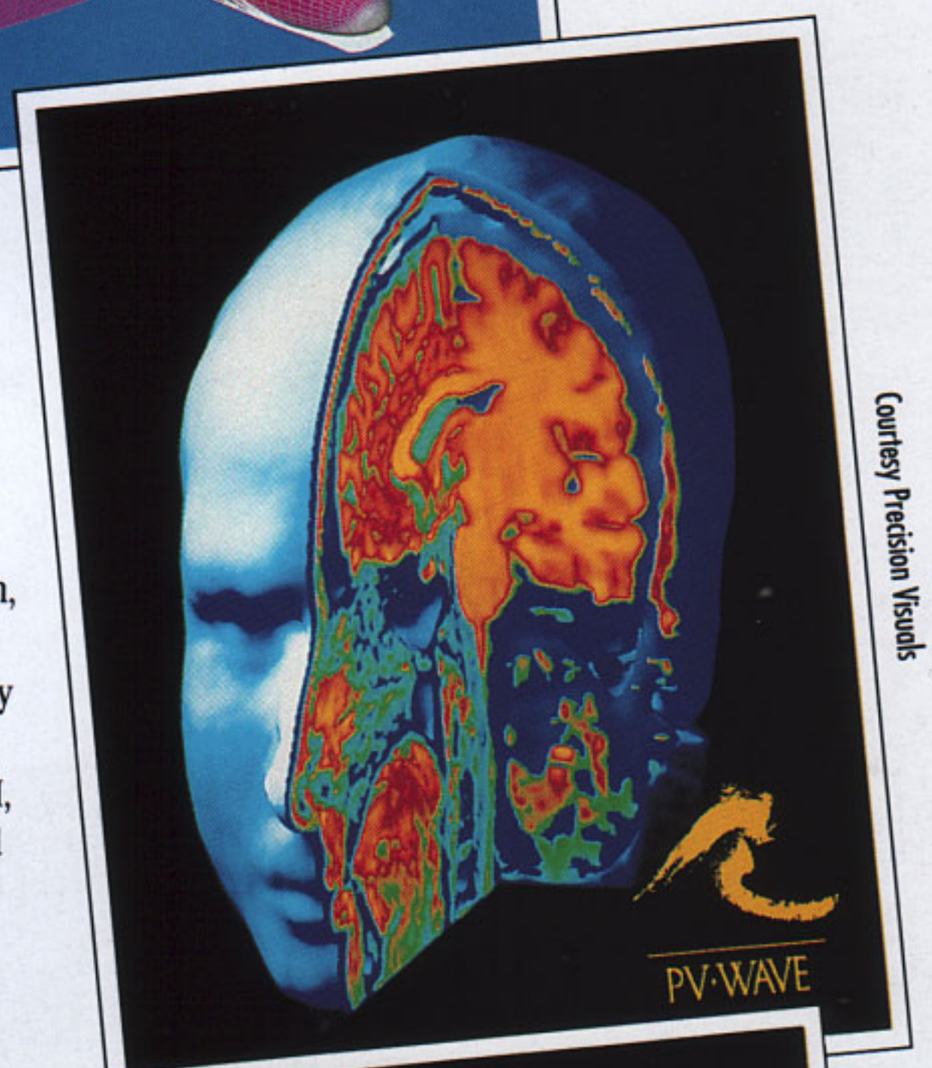


Courtesy Sterling Software / NASA Ames



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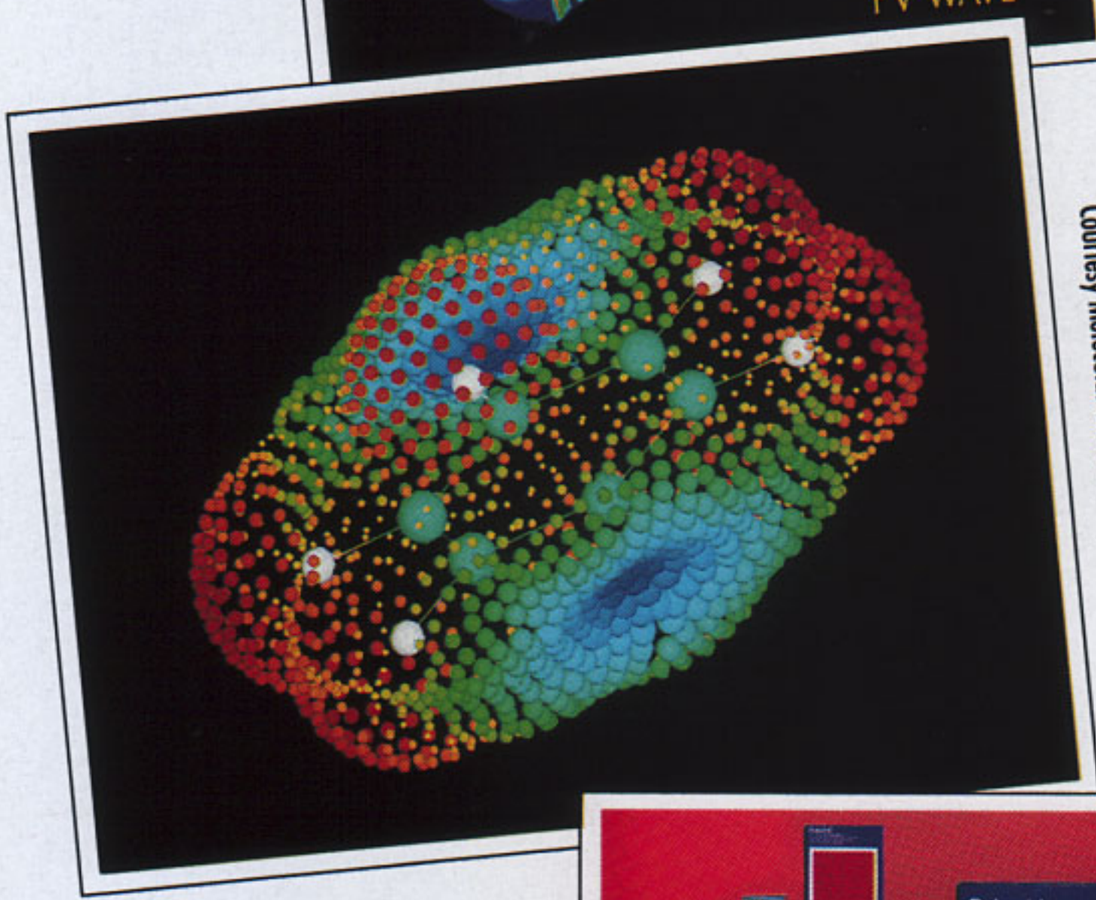

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CANDY *for your* EYES

by Paulina Borsook

David Deak painted pictures for twenty years before he discovered how to use computers to pursue his artistic ends. Then the London born physicist learned how to make Silicon Graphics workstations do his artistic bidding.

The Innocence of Guilt

DaVinci as Model

INTO THE ART WORLD

Now solely represented by the New York City based gallery, Stricoff Fine Art Ltd., Deak, who always painted on the side during his former careers as researcher, inventor and electronics consultant, first ran into Silicon Graphics workstations when he was working on a project involving scientific visualization. A Personal IRIS was employed in work he was doing on medical ultrasound, where the workstation was running what Deak calls routine mechanical modeling software. But Deak was then so busy working on the ultrasound probes that he "only went home to feed the cat" and so made the decision to bring his art studio to work.

Deak initially worked with off-the-shelf programming to create his images. One long-time recurrent image is of a generic wire-frame human figure that he calls Laser Man. Deak says more than one observer has compared Laser Man to Thomas Jefferson, although he insists that Laser Man is no one in particular.

Deak then wrote his own programs that began to enable him to do simple painting. He later moved on to develop source code that would allow him to blend images. Initially working with an IRIS 2400 and then progressing to a 3000, the scientist/artist sought out a way to create a library of images of people to work with, manipulating the computerized figures through a process he calls spectral multiplexing. Here, images are overlaid and superimposed so that not only do the paintings as a whole look different under blue, red and natural light, but images not visible under ordinary light come bounding out when the pieces are viewed under colored light or through colored plexiglas. In fact, Deak's gallery supplied hand-sized strips of blue and red acetate gels at the May 1992 opening for his one man show entitled Eye Candy, so that gallery patrons could see for themselves how the canvases shift in form and content when viewed under different lighting conditions.

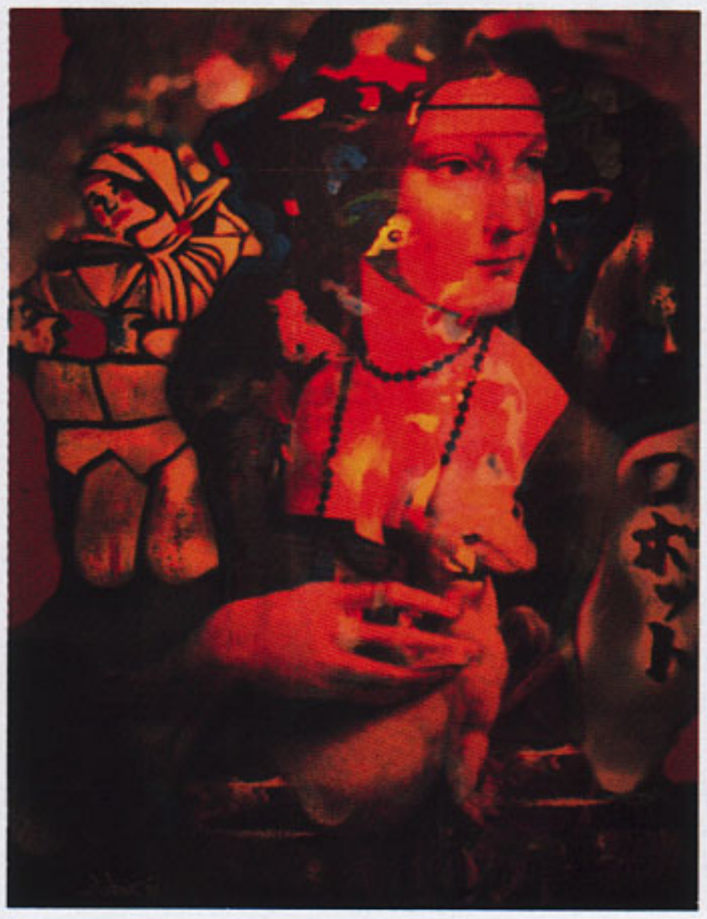
SEEKING IMAGES

In pursuit of evocative images with which to make his computer-generated assemblages, Deak enlisted the help of Carnegie-Mellon University's (Pittsburg, PA) professor Andrew Witkin, who had lots of Silicon Graphics equipment on hand. A scanner in the CMU robotics department attached to an Apple Macintosh was used to scan images as diverse as Da Vinci's painting of a Medici mistress holding an ermine to Madonna and actors in scenes from the *Godfather* movies. The images were then sent by network to Deak's IRIS workstation.

Deak is only able to capture one or two images per high density diskette. And once he no longer wanted to impose on the largesse of his CMU friends, he sought out other alternatives, with rent-by-the-hour Macintosh desktop publishing services turning out to be the easiest way for him to scan in as many images as he desired for use in his paintings. Pittsburg, where he had been living, did not have any of these retail establishments, one factor among many that lead the inventor of acoustic levitation* to pull up stakes in Pennsylvania where he has been living for almost twenty-five years and move to Manhattan, as he attempts to further his career as a full-time artist.

After Deak comes up with a composite of color and image that pleases him, it

*Acoustic levitation is a process Deak initially developed to perfect certain methods of manufacturing. But with his shift from professional scientist/amateur artist to professional artist/amateur scientist, he now uses his unique method of generating standing waves of acoustic air pressure within a cavity to create kinetic sculptures instead of perfecting ballbearings.



Rivals

Maternal Cyborg

is printed out onto a series of 8" by 10" tiles, most commonly output through a three-or-four-pass high temperature silicon thermal dye process. The thermal dye is next laid in a thin film onto clear plastic and then distributed as yellow, red and blue, with the color negative so created producing a color print. Finally, the canvasses are dyed through heat-transfer, with overlay of different colors. Different temperatures create different effects. The finished product also can be overlaid onto a variety of media, including clothing—even bridal satin. Acetate on plexiglas creates an effect that the artist/technologist says rivals stained glass.

PHILOSOPHY OF ART

Deak likes working with computers to create his art because computers allow for quick mistakes. He stares at his completed images for a long time before he is able to give them titles, and they do not get printed out until they have titles. Deak does make video documentation of his works because storing the completed works in computer memory would take up too much disk space. Further, in a video, lighting can be controlled and changed to depict the full visual effect of spectral multiplexing. However, his completed images are one of a kind. The videos are made for archival purposes so, among other things a painting could be reconstituted if it is lost or damaged. But Deak has no interest in turning his computer artistry into a mass production art factory; further, he is not interested in selling the software responsible for his paintings.

To critics who think computer-generated painting in general is not really artistic creation in the true sense, Deak would respond that "a computer has a resolution of 1,200 dots per inch, but a printer has a resolution of 300 dots per inch. The translation between what appears on the screen and what will print out is where the artistic process takes place". He likens the process to Michaelangelo saying that a sculpture is merely there in the marble, and all he did was free it. To other collectors, the high-tech aspect of Deak's work is part of its appeal: as New York collector Todd Stone simply puts it, "I liked the concept and I like that the painting was done on a computer."

One of Deak's collectors, Boston patent attorney Steve Matsuk points out that since Deak "can create his own code, he's not stymied by off-the-shelf software." The computer does not inhibit Deak's creativity and range as it can with those limited to turnkey computer graphics tools. Matsuk goes on to say that "David can express himself more directly because he is multidisciplinary: he can span the bridge between art and technology. He has the keys to the vehicle."

Deak says he seeks out the spiritual in art, but is nonetheless not averse to commercial applications of his work. He has created custom fashion videos for Donna Karan, so that viewers can, for example, see the same suit in different colors. And his dealer, Jeffrey Stricoff, is exploring the idea of limited editions of Deak's work, reminded of the success Warhol had with the multiples of his well known celebrity portraits.

Never one to stand still, Deak is working on a technique to produce holograms without using lasers. But in the meantime, Deak-collector Matsuk says that Deak's work "is as interesting tomorrow as it will be ten years from now. To use a Hollywood term, it has legs."

Paulina Borsook is a freelance writer based in New York.

The work shown on the opening page is entitled "Cogito".

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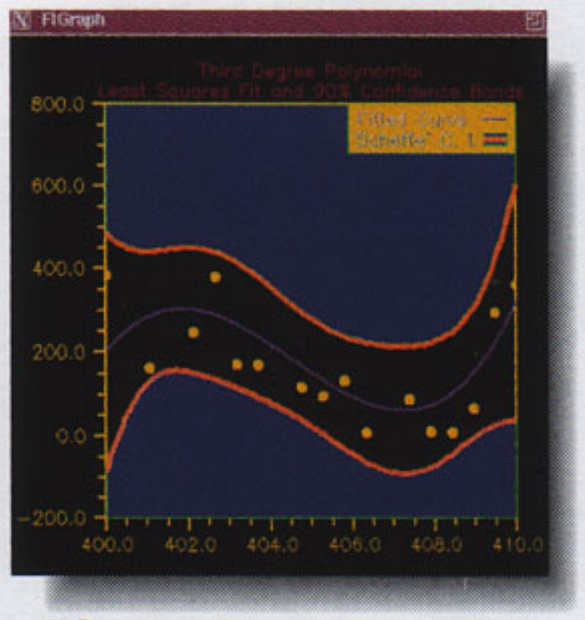

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SCIENTISTS AND ENGINEERS

Whether we want a better shot at new funding or just the respect of our peers, we need to share our work with management, at conferences, with our customers and/or our colleagues. But, bottom line, unless we use video, our work can only be appreciated by the people we bring in front of our workstations.

The good news is that video works, and the hundreds of IRIS users who are already using video are proving its value. A medical researcher at the University of Utah says that his videos have generated dramatic responses at conferences. A molecular modeler in North Carolina says that even just capturing his raw material on video has been a big hit. From the Johnson Space Center in Houston to small independent research labs, the IRIS-to-video connection is expanding the impact of visual computing.

At conferences, video players are almost always available. Virtually every professional has one at home, and they are increasingly in use at corporations and institutions of all kinds. It is now a fact that video is the most convenient and most consistently accessible platform for the display of moving images. The following will help users sort out what scientists and engineers need to know to make videos from their work.

BEFORE YOU START

Even in its simplest forms, video is its own discipline, and your results will benefit enormously from the common sense practice of planning. As with any project, it is important to carefully articulate your objectives. Here is what to do before beginning:

- ***Focus On Your Audience.*** Always remember to whom you are talking. Be aware of their sensitivities and their points of view.
- ***Define Your Message.*** Keep your ideas as simple and clear as possible. We recommend that you focus on one or, at most, two distinct ideas.
- ***Determine Your Resources.*** Develop a strategy for your time and equipment. Estimate how many hours or days of your time you will commit to this project.

Photo: Sam Uselton, Ph.D. of Computer Sciences Corp. outputs aerodynamic simulations to videotape at NASA Ames.

CAN MAKE VIDEOS

by John Leland

In most cases, it is best to begin your planning by writing an outline. List each piece of content that you want to include so that you can consider carefully the elements of your production. The outline should itemize your visual material so you can arrange the order in which it will appear on the screen. Be as specific and as detailed as possible, and your presentation will begin to take shape right before your eyes.

TYPES OF VIDEO PRESENTATIONS

In general, there are three types of video presentations that are used by scientists and engineers: real time visualizations; frame-by-frame animations; and, polished production numbers.

Each one of these three strategies is progressively more complex, has a longer learning curve, and thus requires a larger investment of time and money.

- ***Real Time Visualizations*** — Many scientists can communicate effectively their work to others by outputting their visual data directly to videotape in real-time. This is the closest thing there is to WYSIWYG (what you see is what you get) video.

  This approach is used frequently in presentations to colleagues, for speaker support at conferences and wherever real-time images can get the message across. In most cases, images that are output in this way are described "live" by their creator.
- ***Frame-By-Frame Animations*** — Depending on the kind of visualization you are doing and the image quality you require, you may need to use frame-by-frame recording. This produces a more sophisticated recording, rather than a different kind of video presentation.

  Because frame-by-frame recording is a more complicated technique, it requires a second "layer" of hardware. In addition to a "video out" solution, a video monitor and a video recorder, you will need a computer interface, called an animation or machine controller, and a more sophisticated video recorder. The machine controller creates a signal within your computer that "speaks" to a frame accurate recorder to coordinate and automate the frame-by-frame recording.
- ***Polished Production Numbers*** — More elaborate forms of video storytelling frequently incorporate either or both of the above approaches in addition to using the more time consuming components of a full-blown video production. These may include footage taped with video cameras (for example, interviews with researchers or shots of labs or models), a written script presented by a professional narrator, animated titles, a musical score and more sophisticated editing techniques.

  When a more elaborate production is called for, scientists and engineers generally utilize outside resources either from within their company or university, or from an independent contractor or freelance producer.

Given the range of available video hardware, it is best to start as simply as possible. Simpler productions will give you the experience and confidence upon which more ambitious videos can be built.

GETTING FROM YOUR WORKSTATION TO VIDEO

Whether you are doing real-time visualizations or frame-by-frame recording, your images need to be converted from their RGB high resolution, workstation format to one of the television standards used throughout the world: NTSC, PAL or SECAM. NTSC is the standard for North America and Japan, and is the standard referenced throughout this article.

There are two fundamental types of devices which can output your computer-generated images as recordable video—encoders and scan converters. Encoders translate the way the image is displayed pixel for pixel while scan converters adjust the scan rate in addition to the pixel configuration.

- ***Encoders*** — Encoding, which is used by Silicon Graphics' IndigoVideo and Broadcast Video Option (BVO), takes the exact number of pixels from a portion of the computer screen (about one quarter) and encodes them into a video signal. The portion of the screen that goes out to video can either be fixed (as with the BVO where it comprises the bottom left hand corner of the screen) or floating (as in IndigoVideo and VideoLab).
- ***Scan Converters*** — Scan converters, like Silicon Graphics' VideoCreator, translate the entire workstation screen to a video signal. In general, scan converters produce higher quality images and are significantly more expensive. Because they are almost always external boxes, scan converters also offer increased flexibility. For example, if you have a variety of workstations, a scan converter may serve as the output device for multiple seats—including non-Silicon Graphics workstations.

Image Quality and Resolution

Recording your computer images on videotape involves some compromises. When you get down to the fine points, your IRIS workstation can produce more visual information than video can handle. Although most images come across clearly, expect some changes.

While a Silicon Graphics workstation monitor is made up of 1024 x 1280 individual pixels (820 x 1040 on IRIS Indigo), the lower resolution video signal is made up of only 525 or 626 horizontal lines (depending on the international standard).

It is also important to note that regardless of what type of device you use, video will cut off the edges of your images. As a rule of thumb, you will lose about ten percent around the outside. This occurs, not because the information is lost in

transfer, but because conventional video monitors (unlike computer monitors) do not display the entire image. This is one of several reasons why it is very important to monitor your video output *as video* on a video monitor to check for lost information and changes that may occur during the process of transfer.

EASIER GRAPHICS AND EDITING

Because the IRIS Showcase application ships with all current Silicon Graphics workstations, you have the capability to add simple titles and labels that will enhance almost any video presentation. For example, the simple text and graphics tools that are included in IRIS Showcase can be used to create a title frame (or sequence of frames) to precede and introduce your visualization. With IRIS Showcase's "Slide Show Gizmo," you can even add transitions between the frames.

With any IRIS workstation, you can use IRIS Showcase tools to add labels to images in the same way that you would use a pointer during a presentation. With the IndigoVideo board, you have more extensive tools because its software/hardware combination offers the capability to superimpose graphics over *moving* images.

One of the biggest challenges for new video makers is to design graphics that look good. Here are some tips:

In general, text or characters generated for output to video need to be relatively large (especially compared to the text in the UNIX shell which would be unreadable). In most cases, use 30 point size or larger. Also, bolder is better and contrasting colors are clearer (for example, white or yellow/gold on black reads well). Also, do not mix too many fonts on one page. A maximum of two fonts in any given presentation is a good rule of thumb.

To produce the clearest possible video images, use these guidelines:

- Do not use over-saturated colors such as bright reds, oranges or phosphorescent green. (When using the latest version of IRIS Showcase, this is accomplished by using the NTSC palette.)
- Thin lines (especially single pixel horizontal lines) and fine grain patterns should be avoided, because they cause an annoying visual "buzzing" when transferred to video.

VIDEO HARDWARE

Depending on your budget and type of production, you will need to assemble the necessary components and take into account the anticipated learning curve as well as plan production time. The simplest and most cost effective output system for the IRIS Indigo is the new IndigoVideo board. With its state-of-the-art software enhancements that capitalize on IRIS Indigo's advanced architecture, the IndigoVideo board is truly a price/performance breakthrough.

- ***Video Recorders*** — The large range of features among the wide variety of video tape recorders make a comprehensive explanation near impossible. However, a general direction can be offered:

  Of course, consumer recorders are of lesser quality and usually do not have the capacity to edit without glitches or video breakup between scenes.

  Some "pro-sumer" recorders ($1,000 to $2,000) will enable you to record one scene, push pause while you change images on the computer and then resume recording in order to sequence your images. When you play back recordings made in this way, you get a clean in-point cut, but not a clean out-point unless you are willing and able to assemble your whole program in this manner without pushing stop. The least expensive S-VHS or Hi8 deck with full insert edit capability (in and out) is the brand new JVC BR-S605BU (not the previous model BR-S605A), an S-VHS deck which lists in US dollars for about $2,200.

- ***To Be Frame Accurate*** — The most common animation or machine control system for IRIS workstations is V-LAN, which is built into many of the Silicon Graphics video products, as well as into the Tektronix Avanzar board. Diaquest and Lyon Lamb controllers each use their own systems for machine control—including the Lyon Lamb I-VAS controller for IRIS Indigo.

  Because of the necessary precision, frame-by-frame recording requires a frame-accurate video deck. Some of the newer industrial decks such as the Panasonic 7750 (S-VHS), the JVC BR-S822U (S-VHS), the Sony 9650 (Hi8) and the Sony 9850 (Hi8) are capable of frame-accurate recording. These decks US list roughly in the $6,000 range.

  Laser disk recorders, which are manufactured by Panasonic, Pioneer and Sony, range in US list price from about $19,000 for the write-once units to almost $40,000 for a two-headed rewritable laser disk. These units can record up to forty-eight minutes per disk and offer variable playback speeds and other benefits.

  For pure RGB digital disk recording, Abekas has just released a new disk recorder (model A66), which has an Ethernet SCSI port so that you can connect directly to your network. Besides its US list price of $29,500, you will also pay for its higher quality by being limited to its record time of only fifty seconds. It is, however, rewritable.

When you are getting started, usually simpler is better. Most scientists and engineers minimize production time and hassle because they can frequently deliver their visual communications with relatively straightforward production techniques. Because of the complications involved with frame-by-frame recording and more elaborate video productions, if outputting your visualization to video in real-time is a viable approach, we recommend you use it. In this way, you can keep your focus on your primary concern—your science—and you will still get the enormous benefits of communicating your work to an expanded audience. This will not make you a George Lucas, but it may get you a better budget.

Jon Leland is an award-winning video writer/producer/director and an expert on desktop video system design. His Mill Valley, California company, Communication Bridges produced The Desktop Video-Video, a professional level, educational video program.

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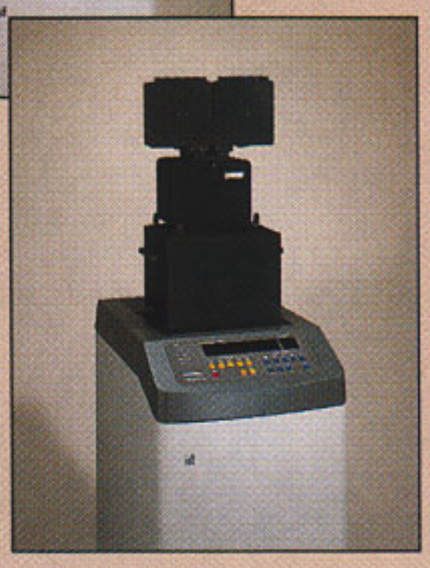

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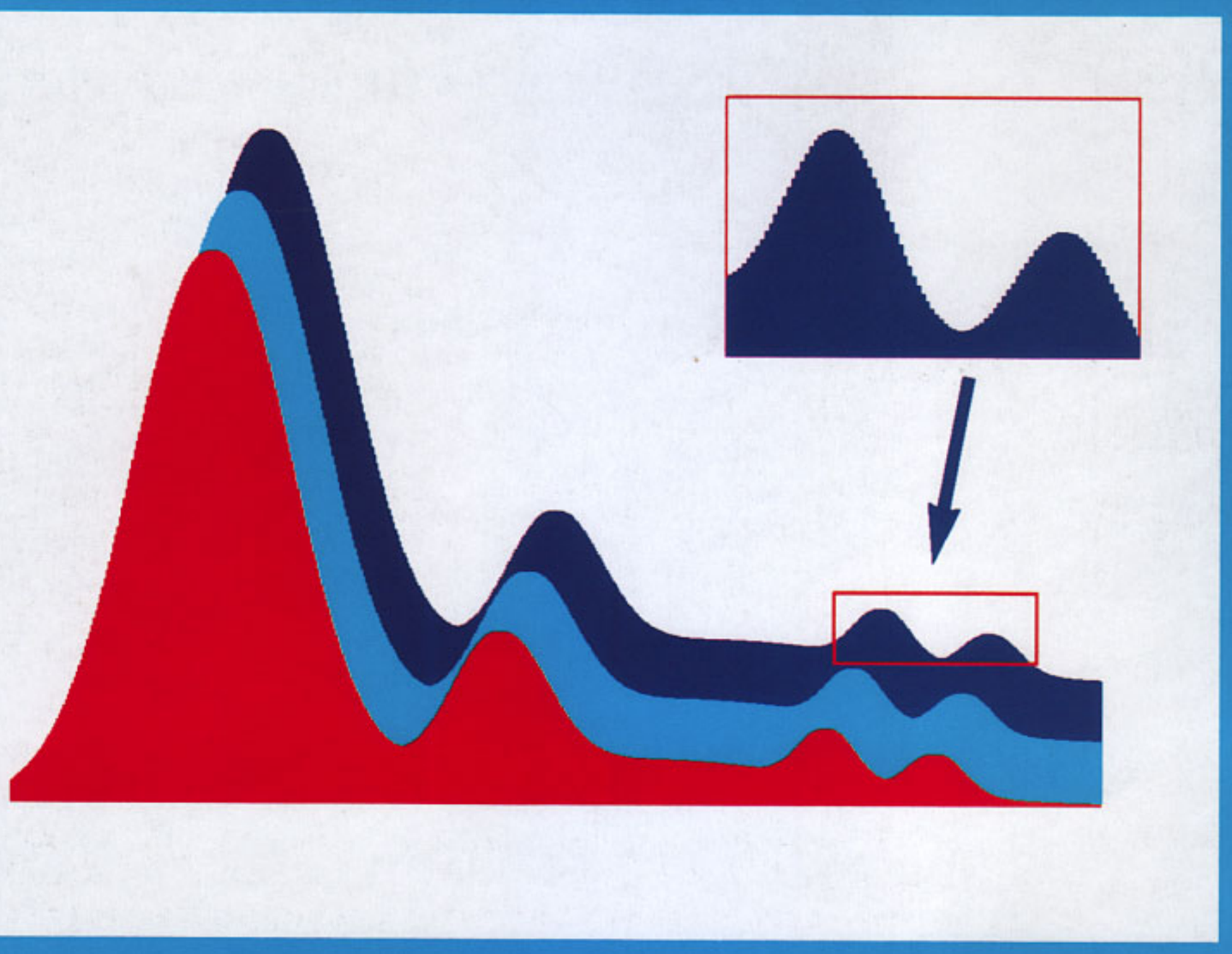

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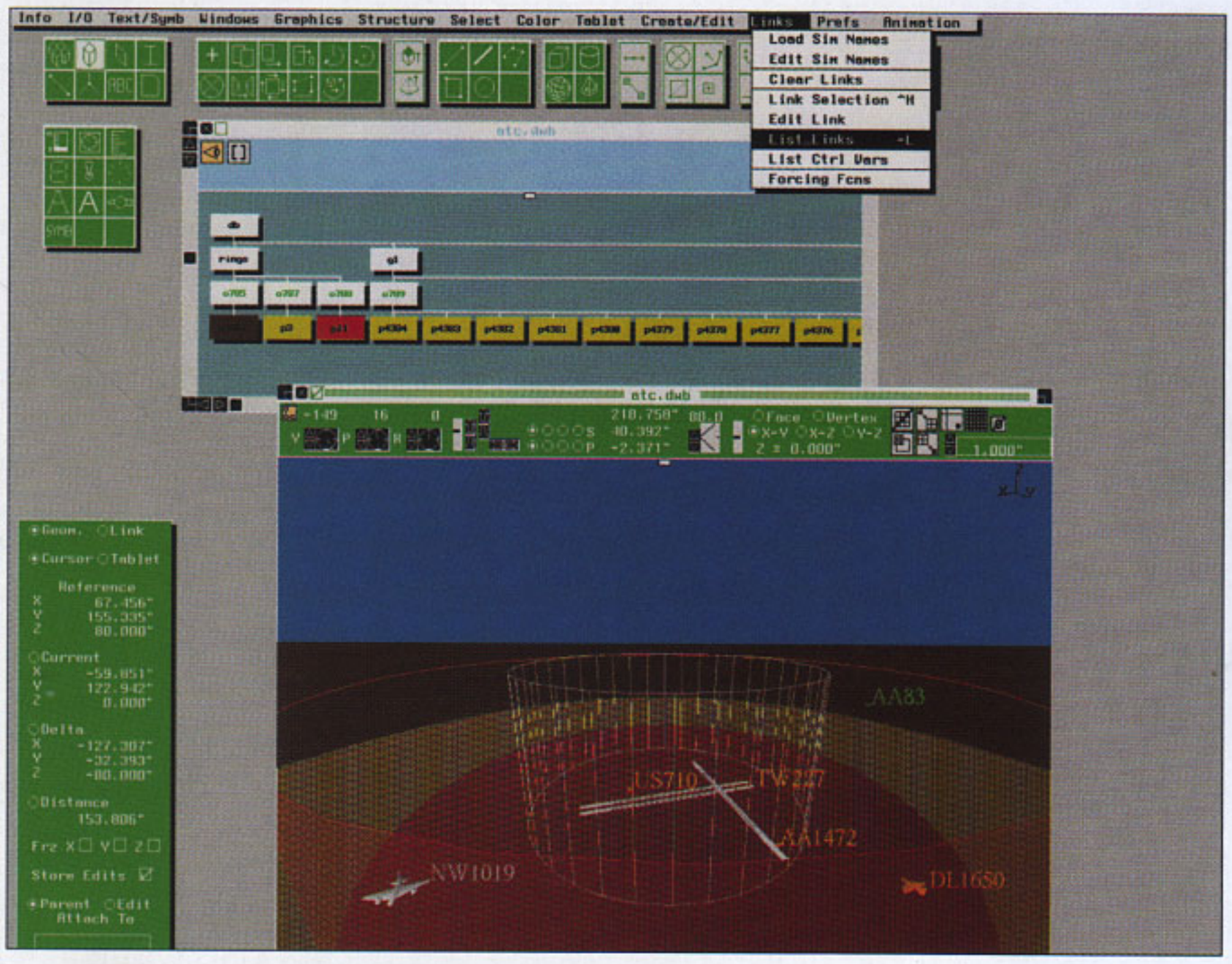

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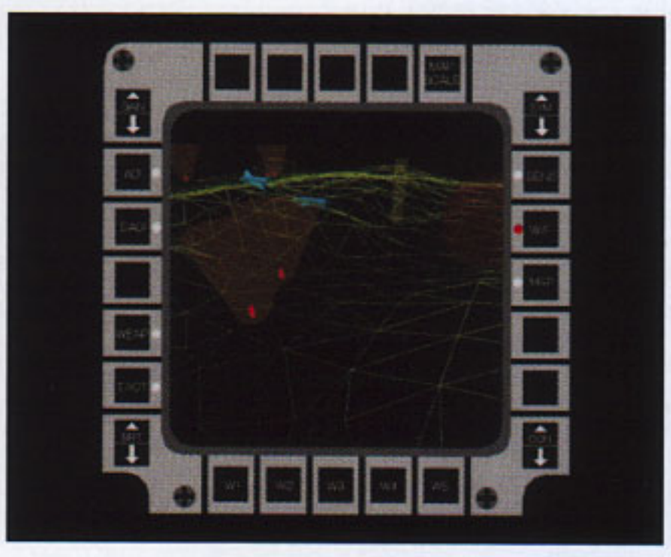

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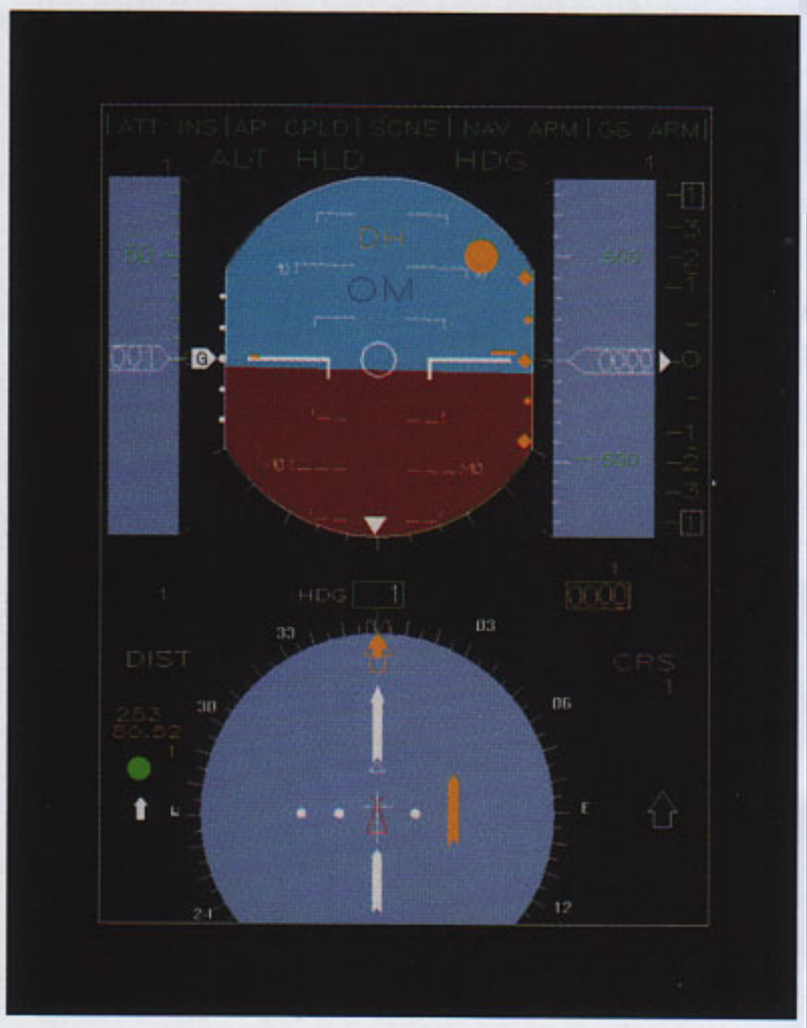

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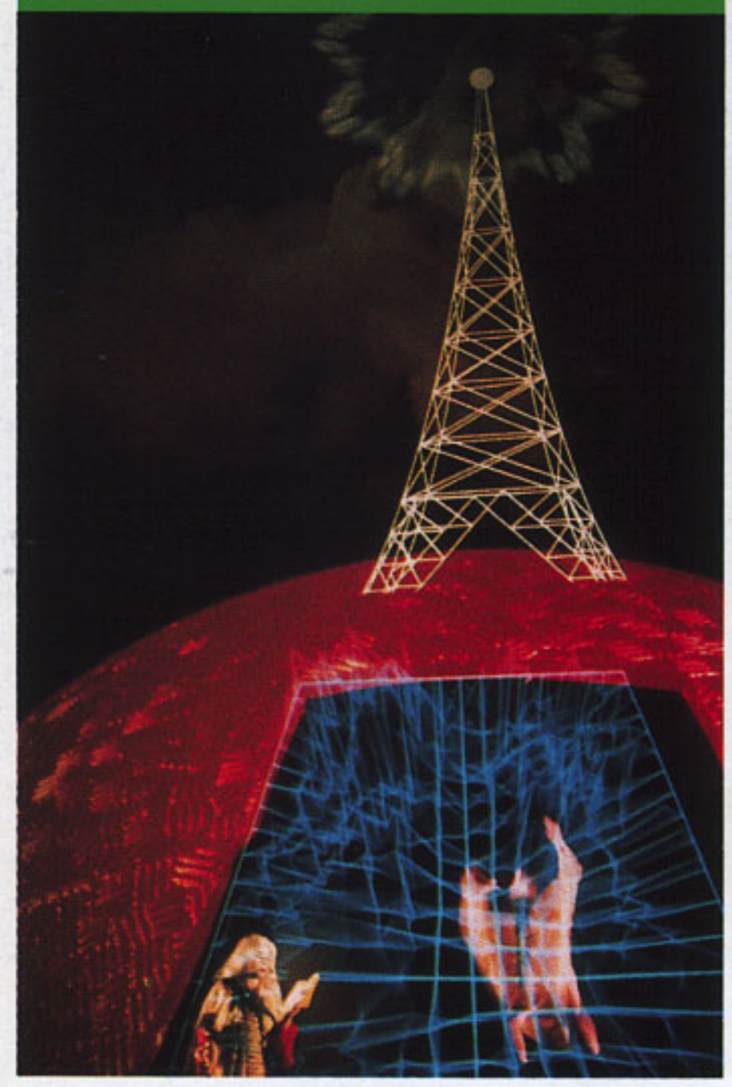


EVOLUTION OF THE INVISIBLE SITE

WHY IS IT the success of your effects always depends on how bright your video projection is? So mused Tim Heidmann, software engineer in new applications at Silicon Graphics, Inc. Heidmann is one of the team of Silicon Valley technologists to contribute his computer graphic skills to George Coates Performance Works (GCPW) production of *INVISIBLE SITE*. The show is the first live music/theater performance to make extensive use of high speed computers for special effects graphics. The Silicon Graphics VGX workstation enables live actors to perform alongside video projections of real time, 3D, computer generated imagery and environments.

INVISIBLE SITE: A Virtual Sho premiered at SIGGRAPH '91 as a special addition to the Electronic Theatre. This was not the first George Coates Performance Works production to marry technology with theater. The San Francisco based Coates has had an ongoing exchange with the technologists of Silicon Valley for several years. This relationship started in 1988 when he helped to conceive the staging of Steve Jobs' NeXT computer rollout at Davies Symphony Hall.

George Coates' reputation for innovative theater has found its way to the east coast and Europe where his company often tours. Some of his better known productions include *Rare Area*, *Actual Sho*, *RightMind*, and *The Architecture of Catastrophic Change*. With each production, Coates has added innovative applications of emerging technology. To formalize this collaboration between technology and the theater, Coates founded the Science Meets the Arts Society (SMARTS). Through SMARTS, his multimedia theater has become an experimental site for engineers, programmers, and artists from the likes of Silicon Graphics, Apple, and NASA.

INVISIBLE SITE's premiere at SIGGRAPH '91 was supported by several companies and individuals, including Silicon Graphics, which donated an IRIS VGX workstation and the expertise of its engineers and programmers. The basic premise of *INVISIBLE SITE's* plot revolves around a pay-for-play virtual reality encounter which goes astray when a hacker invades the participants fantasyland. To create the *INVISIBLE SITE* environment, computer generated images, 16 mm film, and 3D slides were projected onto a 30' x 60' perforated aluminum screen, known as a scrim, with a very bright high definition video projection system. The scrim allowed the audience to view both the projected elements and the live actors behind it with 3D glasses, creating the illusion that they are interacting with the graphics.

According to Tim Heidmann, one of the Silicon Graphics' engineer/programmers on loan, "We took a number of existing IRIS demos and made them interactive. With a couple of keystrokes the computer operator, Frances Dose, could play them in sync with the actor's movements on the stage. One of the demos we used was Thant Tessman's Wave program. We used it to generate a fine, blue mesh. Then we wired up a bunch of keyboard buttons to let the operator control the effect. In the show, a caged actor would push against the mesh. It would recoil and then bounce back. It was probably one of the simplest effects in terms of graphics, but one of the more effective ones in terms of interactivity," elaborated Heidmann.

3D computer generated puppetry added to the realism of the effects. Heidmann wrote a program that would bring elements created in Swivel 3D on a Macintosh into the IRIS. The IRIS operator would position the elements' key frames. From the keyboard, she could interactively move among the key frames to create an animation. The computer operator could also grab any of the elements with the mouse and move them around. An example of this 3D puppetry occured in a scene demonstrating a new video game. For the game, a computer chip was implanted in the back of the optic nerve. A giant eyeball would watch an actor as he tried to avoid the eyeball's gaze.

The most difficult challenge of *INVISIBLE SITE* was trying to coordinate all of the effects with the actors movements and the music. The effects were created by different kinds of computers, 35 mm slides, 16 mm film, lighting, moving sets, and some undisclosed Coates magic.

The *INVISIBLE SITE* was a dynamic show with new dialogue and scenes written on a daily basis. The technology's ability to evolve with the show was crucial element of *INVISIBLE SITE's* final success. As an observer, Heidmann relates, "When I was working there everyday, I got the chance to see *INVISIBLE SITE* evolve. When you go there one night and see a performance, you have no idea how the show got to that point. Being able to see the entire process, that was the real show for me."

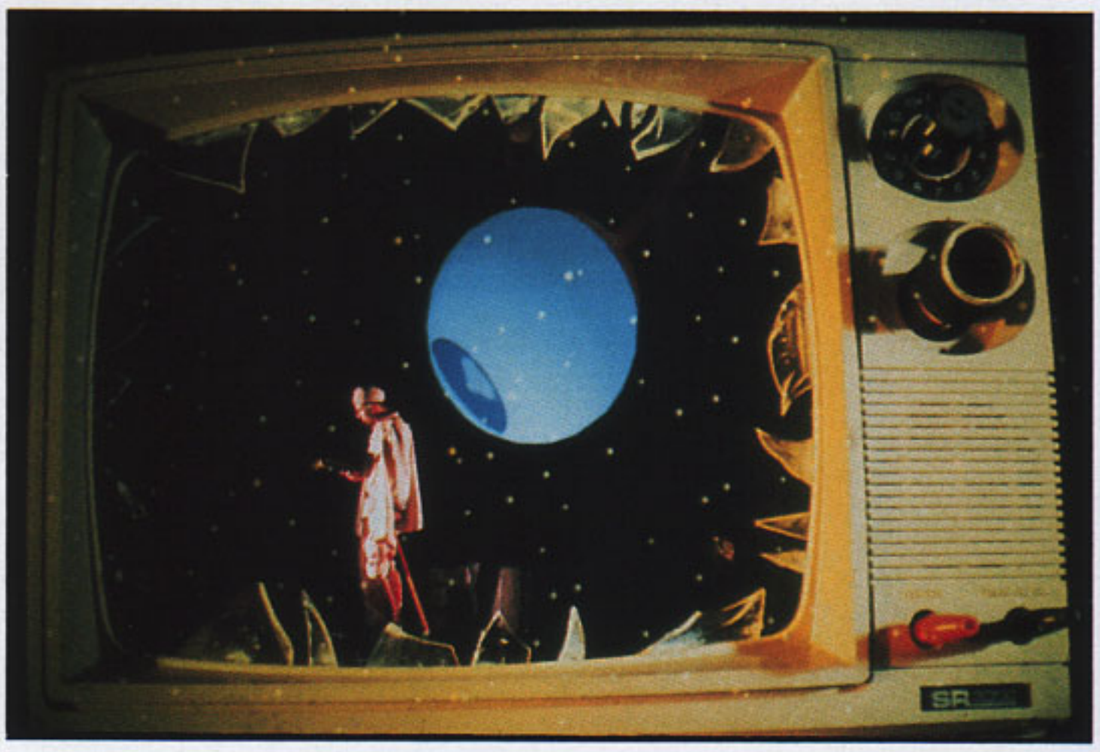
by Gaye Graves

In the future, coordinating a show like *INVISIBLE SITE* would become much easier if all of the elements shared a common platform or were controlled by the same computer. Perhaps if more of the effects were truly interactive, triggered by an actor's dataglove, then more of the effects coordination could be done by the computer. The computers' capabilites could be used to do more than create images. Until that day arrives, we can not help but admire those individuals who can thrive working with the leading edge of emerging technology.

For more information, contact: George Coates Performance Works, 110 McAllister Street, San Francisco, CA 94102, (415) 863-8520 or fax (415) 863-7939.

Gaye Graves is Departments' editor for IRIS Universe.

Images courtesy of George Coates Performance Works and Jennifer Saver.



CLARK SPEAKS AT ART CENTER

Silicon Graphics Chairman of the Board, James Clark, delivered the commencement address at Art Center College of Design in Pasadena this Spring. Clark's selection as speaker reflects Art Center's strong ties to industry. These ties to industry are reinforced by Art Center's curriculum which includes transportation design, product design, and animation, as well as graphic design, illustration, and photography.

Included in the festivities was the official dedication of the General Motors Computer Graphics Laboratories, which comprise one of the world's most advanced and best equipped facilities for design education and computer graphics. The lab houses an integrated computer system for two- and three-dimensional design, animation and digital imaging. Future capabilities will expand to include interactive media technologies. Silicon Graphics has donated over $250,000 worth of equipment to Art Center.

EXPLORE THE FRONTIERS

McLean, Virginia will host Frontiers '92, the 4th Symposium on the Frontiers of Massively Parallel Computation on October 19-21, 1992. This symposium is the fourth in a series of biannual meetings on massively parallel computation, focusing on research related to, or adaptable for, systems with 1,000 or more processors. Workshops, tutorials and papers will be the primary activities at the symposium.

Frontiers '92 is sponsored by the IEEE Computer Society and NASA's Goddard Space Flight Center. If you would like an advance program and registration, please send name, address and email address to James Fischer, Frontiers '92, Code 932.1, NASA Goddard Space Flight Center, Greenbelt, MD 20771 or email to: f92info@gmuvax2.gmu.edu.

CAN YOU VISUALIZE IN '92?

Scientific visualization is an important research frontier shared by a variety of computational science and engineering fields. Visualization work is both interdisciplinary and a field in its own right. Visualization '92 focuses on interdisciplinary methods and supports collaboration among the developers and users of visualization methods across all of science, engineering and commerce. The interdisciplinary nature of the conference is reflected in the diverse nature of the presentation formats that comprise the conference.

The Visualization '92 conference will becoming to Boston, MA on October 23, 1992. The formats for presentation include papers, panels, tutorials, workshops, and interdisciplinary case studies. Visualization '92 is sponsored by the IEEE Computer Society's Technical Committee on Computer Graphics. For more information, contact conference chairs: Georges Grinstein, Univ. of Massachusetts at Lowell, (508) 934-3627, email: grinstein@csowell.edu or Bruce Brown, Oracle Corporation, (415) 506-6202, email: brown@us.oracle.com.

EUROGRAPHICS OBJECT-ORIENTED GRAPHICS WORKSHOP

The goal of the Third Eurographics Workshop on Object-Oriented Graphics is to outline a common platform, based on a set of object-oriented primitives, for the support of graphics applications. An object-oriented platform may encompass any kind of functionality to support graphics applications. Possible topic areas include: support of reuse and extensibility in graphics systems; concurrency and distribution support for graphics applications; standards for data exchange such as geometric primitives, scripts, sound and video; the integration of constraints in graphics systems; the binding of input/output activities to objects and user interaction; encapsulation as a mechanism for interoperability of graphics applications, and, object-oriented wrapping of existing graphics functions.

The workshop will be held October 28-30, 1992 near Geneva, Switzerland. The workshop is organized by the Centre Universitaire d'Informatique of the University of Geneva and promoted by Eurographics. For more information, contact: Centre Universitaire d'Informatique, 12 rue du Lac, CH-1207 Geneva, Switzerland, (41) 22 787 65 86, fax (41) 22 735 39 05 or email: eoog@cui.unige.ch.

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EUROGRAPHICS 92

This Eurographics 92 is the 13th annual event of the Eurographics Association. It will convene in Cambridge, England, on September 7-11, 1992. It is the leading international computer graphics conference in Europe and a vital meeting point for researchers, practitioners, industrialists, teachers and users. It is a forum for the latest developments in graphics technology, for case studies in graphics systems and applications, and for surveying the state of the art.

There are three predominant themes running through the conference: multi-media and hypermedia; graphics technology and people; and, graphics and communications. Two days of the conference will be devoted to tutorials. The heart of Eurographics 92 will be the computergraphics exhibition that will provide a special forum for technology suppliers, developers and researchers to meet informally. Local, national, and interna-

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tional companies and organizations will be represented demonstrating state of the art products and techniques.

For an advance program, contact: Jane Thorp, EG 92 Conference Secretariat, The Registry, University of East Anglia, Norwich NR4 7TJ, England, (+44) 603 592802, fax (+44) 603 250035 or email: eg92@uk.ac.uea.sys.

HUMANS WELCOME AT HCI '92

The annual HCI conference brings together researchers and practitioners, from both industry and academia, who are working to improve the effectiveness of computers as tools for people. HCI '92 will be held September 15-18, 1992 at the University of York, York, United Kingdom. Key topics for the conference include design, design methodologies, evaluation, formal methods, groupwork, intelligent and adaptive interfaces, interaction architectures/tools/techniques, models of the user, multimedia/hypertext/hypermedia, organizational and societal issues, standards, user interface management and users with special needs.

For more information, contact: Francoise Vassie, Centre for Continuing Education, University of York, York YO1 2EP U.K., (09) 04 433901, fax (09) 04 433949 or email: FV1@uk.ac.york.

OPEN YOURSELF TO THE FUTURE

UNIX Expo '92, the Open Systems Show, offers attendees the opportunity to see the newest and best UNIX and Open Systems solutions from more than 275 top companies worldwide.

Find out what is in store at the UNIX Expo '92 at Jacob K. Javits Convention Center, New York City, September 22-24, by calling (800) 829-3976, ext;. 8301.

IMAGE ANALYSIS AND PATTERN RECOGNITION CONFERENCE

ITAPR '92 will be dedicated to modern and prospective information technologies for image analysis and pattern recognition problems. This conference will be held September 20-26, 1992 in Kiev, U.S.S.R.

The conference will include papers, tutorials, invited papers, and a two-day workshop for the presentation and discussion of results of R & D projects funded under the Soviet National Programme. All events will be organized and coordinated by the Scientific Council "Cybernetics" of the U.S.S.R. Academy of Sciences, Moscow. For more information, contact: Igor B. Gurevitch, The Scientific Council "Cybernetics", U.S.S.R. Academy of Sciences, 40, Vavilov Str., Moscow 117967 GSP-1 U.S.S.R., 7 (095) 124 73 89 or fax 7 (095) 292 65 11.

ARTISAN COMES TO SGI

Media Logic, Inc. announces Artisan 2.2, a full color, high resolution paint and image retouching system for publications, business graphics, scientific visualization and animation applications on IRIS's running system 4.0.1. Artisan allows you to create, retouch, crop, composite and enhance images of any size and resolution simply and more effectively. User-definable, anti-aliased brushes provide line, airbrush, copy, sharpen, blur, pattern and other custom operations. Artisan comes equipped with a complete set of objects for area definition and drawing.

Artisan's compositing features enable cutting and pasting of multiple images, scaling and rotating while pasting, and modifying opacity using alpha channel and image map functions. Masking and frisketing are supported for all operations including brushing, area filling, and image compositing. Image preview functions provide scale, orientation and position checking prior to final image merging. Other features include area flood and fill, multidirectional gradients, variable opacity, editable patterns up to 64 x 64 pixels in size, and a variety of special effects. Shade inverting, brightness, contrast, and gamma correction can be performed on any portion of an image. High resolution images can be imported and exported through TIFF, Targa, Wavefront, Alias, and other image file formats. Encapsulated Postscript (EPS) is available for image export and output to Postscript based hardcopy devices.

For more information, contact: Laura Lieben, Media Logic, Inc., 17351 Sunset Blvd., Suite 304, Pacific Palisades, CA 90272, (310) 573-7575 or fax (310) 573-7585.

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THE NEW PV-WAVE 4.0

Precision Visuals, Inc. announces PV-WAVE Command Language (CL) Version 4.0. PV-WAVE Command Language is the company's flagship VDA product for technical professionals who develop data analysis and visualization applications. With CL Version 4.0, Precision Visuals has added functionality to PV-WAVE in four areas identified by application developers as essential to their productivity. These areas are connectivity, data access and manipulation, graphical display techniques and ease of use.

New features for connectivity include dynamic linking and direct linking, which allows PV-WAVE to easily integrate with other commercial packages or custom software (i.e. Mathematica, AVS, Explorer). CL Version 4.0 also features an Encapsulated Post-Script Interchange (EPSI output driver that allows users who create graphics in PV-WAVE to electronically paste them into documents created with desktop publishing software like FrameMaker, Interleaf and The Island Series. The new PICT output driver enables PV-WAVE graphics to be exported in standard formats for display with Macintosh software.

Among the new data access and manipulation features are: date and time data structures, which allow users to easily collect, manipulate and plot time series data; data connect routines, which let users read and write data with single command to standard format (i.e. TIFF, ASCII); and table tools, which allow users to browse through their records-based data (i.e. company telephone usage data) and create subset tables using Structured Query Language like syntax. The table tools are independent of the database software the customer uses with CL.

CL Version 4.0 features a powerful rendering function based on advanced ray tracing techniques. For the first time, high end volumetric data display, common in computational fluid dynamics, geophysical and medical research applications, will be available to users without high end budgets. In addition to the new features built into CL Version 4.0, users can purchase an optional product, PV-WAVE:UIM/X, which allows developers to build customized graphical user interfaces for their PV-WAVE CL application.

For more information, contact: Peter Masi, Precision Visuals, Inc., 6230 Lookout Road, Boulder CO 80301, (303) 530-9000 or fax (303) 530-9329.

SPYGLASS TRANSFORM SHRINK-WRAPPED

Spyglass, Inc. has announced the delivery of Spyglass Transform for the entire Silicon Graphics IRIS 4D product line. Utilizing the Motif windowing system, Transform lets IRIS users create color raster images, line graphs, surface plots, contour plots, and vector plots from 2D data arrays, all done with a point and click interface. Transform is a shrink-wrapped visual data analysis package for UNIX workstations.

Transform features color raster imaging technology for plotting, which quickly converts arrays of numerical values to colors, creating a vivid image of the data. A user can generate simple or interpolated raster images, then explore and highlight regions of interest by changing and altering color tables. Users can also generate (and overlay) a useful variety of other plot types. Users can manipulate and analyze data using built-in functions in the Notebook window, which also stores notes and observations with the dataset. The Data Import program reads and converts most data formats, including 2D ASCII data, ASCII Special (a special format to import numerical scales) and ASCII X-Y column data: 2D and 3D HDF datasets.

For more information, contact: Spyglass, Inc., 701 Devonshire Drive, C-17, Champaign, IL 61820, (217) 355-6000 or fax (217) 355-8925.

HYPERMESH TEAMS UP

In a joint statement, Altair Computing and Livermore Software Technology has announced the completion of a cooperative project to enhance Altair's HyperMesh code, providing graphics support for the powerful analytical capabilities of Livermore's LS-DYNA3D—widely regarded as the premiere analytical tool for examination of highly nonlinear structural phenomena such as automobile crashes. The impressive graphic speed of HyperMesh makes it uniquely appropriate for creation, display, and manipulation of large and complex models required for such analyses.

HyperMesh uses a powerful template driven interface system to produce input data for analysis. Although standard templates are provided for many popular finite element codes, users can customize these or create templates according to their own specifications. Wireframe or hidden line animations can be made of displacements, mode shapes or transient data.

For more information, contact: James A. Flowers, Director of Marketing, Altair Computing, 3150 Livernois, Suite 270, Troy, MI 48083, (314) 968-6485

STRUCTURE SEARCHING SOFTWARE FROM TRIPOS

TRIPOS Associates Inc. has announced its new chemical information mangement software, SYBL/3DB UNITY. UNITY provides critical new analysis tools for effective management of today's chemical information. SYBL/3DB UNITY is an all encompassing suite of chemical information tools. Phase 1 software provides 2D/3D structure searching and storage, printing of structure reports, integration with SYBL/3DB UNITY molecular visualization and modeling, and chemical registration. Screens are independent of fragments, and thus can be customized depending on specific needs.

UNITY's flexibility allows users or database administrators to use system-supplied defaults or have complete control of the screening system. UNITY also effectively handles aromaticity and provides for easy database file translations. SYBL/3DB UNITY runs on UNIX and VAX/VMS platforms.

For more information, contact: Norma Hansen, TRIPOS Associates Inc., 1699 South Hanley Road, Suite 303, St. Louis, MO 63144, (800) 323-2960 or fax (314) 647-9241.

VIDEO MULTIPLEXER FROM RGB

RGB Spectrum introduces OmniView, a flexible and efficient system to display, record and transmit signals from multiple video sources. OmniView combines a sophisticated multiplexer/demultiplexer with a reconfigurable multi-window display on a high resolution monitor. The system is designed to monitor multiple camera signals while recording on a single video tape recorder or transmitting on a single channel.

OmniView accepts NTSC (RS-170) or PAL (CCIR) rate video signals. Video sources can be asynchronous. No genlock is required. The system displays up to fifteen video sources in monochrome windows on a high resolution monitor. Each window can be independently positioned and smoothly scaled from 1/64 to full screen. Recording of the video is time multiplexed (i.e., time shared interleaving of the video signals on a frame-by-frame basis). The multiplexed video is encoded with data used later to recreate the separate video signals and can be labelled with up to 64 alphanumerical characters.

OmniView allows up to fifteen video signals to be recorded on a standard video tape recorder for later replay. Images consist of time interleaved frames at full video resolution. On replay, the images are demultiplexed and displayed as video windows on the high resolution monitor. Each window's position, size and visibility can be maintained as originally recorded or respected on playback. In a similar manner, Omniview makes it possible to transmit up to fifteen video signals over a single channel. Each video frame is encoded with information on time, date, and window parameters. The video is demultiplexed by an OmniView system on the receiving end.

For more information, contact: Carol Fogel, RGB Spectrum, 950 Marina Village Parkway, Alameda, CA 94501, (510) 848-0180 or fax (510) 848-0971.

MOTIF AND OPEN LOOK INTEGRATION

The V.I. Corporation has announced Release 9.0 of the DataViews family of dynamic graphical user interface tools. DataViews Release 9.0 includes integration of Motif and Open Look widgets as input objects, and allows users to customize their graphical user interface by importing complex images such as photographs or bitmaps into their interface. In addition, text and visibility dynamics have been enhanced, and the capability to use subdrawings and their dynamics has also been added.

DataViews consists of the DV-Draw graphical editor, with which developers can create graphical user interfaces for complex application without programming, and the DV-Tools subroutine library for linking screens created in DV-Draw to the underlying application. Other enhancements in Release 9.0 include reduced load time for complex views, an expanded text editing option that allows the user to edit anywhere within a text object string, an improved graph model that includes automatic graph clipping, and six new graph types that bring the total to more than sixty-five graphs.

Incorporated in DV-Tools Release 9.0 are prototyping routines allowing a DV-Draw prototype to be run with DV-Tools. Release 9.0 also contains a bridge to connect TekBase, a database management system for scientific and technical applications, with DV-Draw, allowing the user to link TekBase data to sophisticated full-color graphics. Floating network licences are available on Release 9.0 to allow users to run DataViews on any workstation in a network.

For more information, contact: Andrew Copeland, V.I. Corporation, 47 Pleasant Street, Northhampton, MA 01060, (413) 586-4144 or fax (413) 586-3805.

SCRAMNET REHOSTABLE NETWORK INTERFACE

SYSTRAN has introduced the R1600 Rehostable Network Interface which allows any bus architecture to be integrated into the SCRAMNet Network. Designed for any proprietary or low volume backplane, the R1600 consists of a compact, rack-mountable external enclosure that houses the SCRAMNet Network interface less specific host system bus adaptor circuitry and a general purpose interface port that includes the address, data and control lines necessary to read and write to memory and registers, and to pass interrupts to and from the SCRAMNet Network.

A separate adaptor board in the host system contains all of the circuitry necessary to meet specific host bus requirements. This "host adaptor" is attached to the Model R1600 interface via the general purpose interface port. With the R1600, system architects can now use custom designed host adapters to integrate bus architectures that are not directly supported by SYSTRAN into the SCRAMNet Network.

For more information, contact: SYSTRAN Corp., 4126 Linden Avenue, Dayton, OH 45432, (800) 252-5601.

CGTECH ANNOUNCES REVPOST

A new post-processing module called RevPost has been released for CGTech's popular VERICUT software. RevPost converts man-readable machine code files containing G-codes, M-codes, and other machine codes into a format, which is processed by VERICUT. VERICUT is a low cost package that interactively simulates, verifies, and displays the metal removal process of a NC (numerical control) tool path, and runs on most popular workstations and 386 PCs.

RevPost consists of three major functions. CONTROL SETUP allows configuration of RevPost to meet specific machine requirements by customizing machine code control information. COONTROL FILES saves customized information and allows loading or retrieval of the saved file for subsequent use. CONVERSION is the process that converts a machine code file into a file which can be processed by VERICUT. VERICUT can read tool paths from almost all major CAD/CAM software packages including programs from CADAM, CATIA, CimLinc, Computervision, MCS, McDonnell Douglas, NCCS, and Point Control, as well as AutoCAD and CADKey based NC packages.

For more information, contact: CGTech, 15375 Barranca, Bldg. L, CA 92718, (714) 753-1050 or fax (714) 753-1053.

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Parallel Programming 4.5 days	November 9, 1992	September 28, 1992	N/A
Real-Time Programming 4.5 days	September 14, 1992 November 30, 1992	October 12, 1992	N/A
Motif Programming 4.0 days	September 21, 1992 November 16, 1992	August 31, 1992 December 14, 1992	N/A
Mastering IRIX 4.5 days	August 17, 1992 September 14, 1992 October 19, 1992 November 9, 1992 November 30, 1992	November 2, 1992	August 3, 1992 October 12, 1992 November 30, 1992
System Administration 4.5 days	August 24, 1992 September 21, 1992 October 26, 1992 November 16, 1992 December 7, 1992	September 14, 1992 Noember 30, 1992	August 10, 1992 October 19, 1992 December 7, 1992
Network Administration 4.5 days	December 14, 1992	October 5, 1992	August 17, 1992
System Maintenance POWER Series 10.0 days	September 21, 1992 October 26, 1992 December 7, 1992	August 3, 1992 November 9, 1992	N/A
Advanced System Administration 4.5 days	August 31, 1992 November 2, 1992	September 21, 1992 December 7, 1992	N/A
IRIS Inventor 4.5 days	August 10, 1992 October 5, 1992	N/A	November 16, 1992
IRIS Explorer 4.5 days	August 24, 1992 October 26, 1992 December 14, 1992	N/A	N/A

KEY: WEC—Western Education Center, Mountain View, CA.
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SEC—Southern Education Center, Dallas, TX.

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Improve Your Image

When you're scanning, printing or animating on a Silicon Graphics® Personal IRIS™ or 4D series workstation, you want images that impress. With GBA's easy-to-use and versatile SCSI® drivers for color scanners, printers and laser videodisc recorders, you get the highest 24-bit resolution, over 16.7 million colors, to make your images *pop!*

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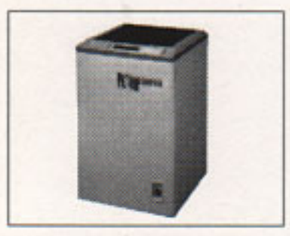
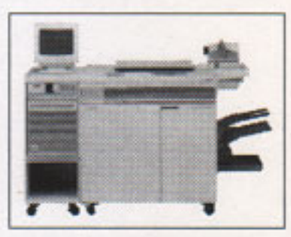
PIXELVISION™ controls the Sony laser videodisc recorder from RS422 and RS232C direct controls with 100% frame accuracy. Work with Alias, Softimage and Wavefront, or create your own on line image library and animation with a push button interface and scripting. Playback forward or reverse in single-step, slow, normal and 3x or 30x fast forward. Also, indefinite still-frame pause, scripted edit list and random frame access.

PRINTERS



FUGIX PICTROGRAPHY 2000
Uses LED scan process to print with 256 steps of CMY for 16.7 million colors. 284 dpi. Letter size sheets; glossy/semi-mat paper; OHP sheet film.

KODAK XL-7700
Produces 8.5x11 in. or 11 in. square prints at 200 dpi. Dye thermal sublimation. Outputs hard copy or transparencies.

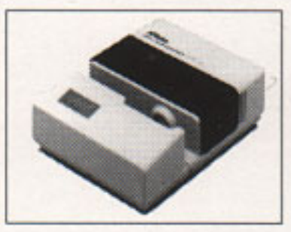


CANON CLC-500™
Uses Digital Image Processing System to print 8.5x11, 8.5x14 or 11x17 in. at 400 dpi. 64 gradations per color (CMYK). Halftones — 256 gradations. Also scans.

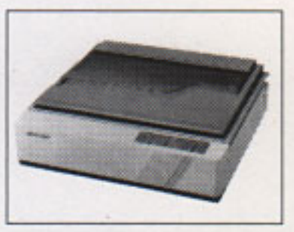
NIKON CP-3000
Prints CMY in 256 gradations and 16.7 million colors. Dye thermal sublimation. 5x6.3 in. paper or transparency; 200 dpi, up to 1024 x 1280 pixels.

DUPONT 4CAST® / JVC
Prints 12x12 in. hard copy at 300 dpi with 256 gradations of each color (CMYK) using sublimation heat transfer.

SCANNERS



NIKON LS-3500
Scans 35mm film at up to 4096x6144 pixels. Reads positive or negative, color or monochrome. 256 color gradations, over 16.7 million colors.



SHARP JX-600/450/320
Scans reflective art or transparency, positive or negative, color or monochrome, in one pass. Originals up to 11x17 in. (film up to 8x10). Up to 600 dpi on JX-600; up to 300 dpi on JX-450; 16.7 million colors. JX-320 scans 8.5x11 in. reflective art at up to 300 dpi.

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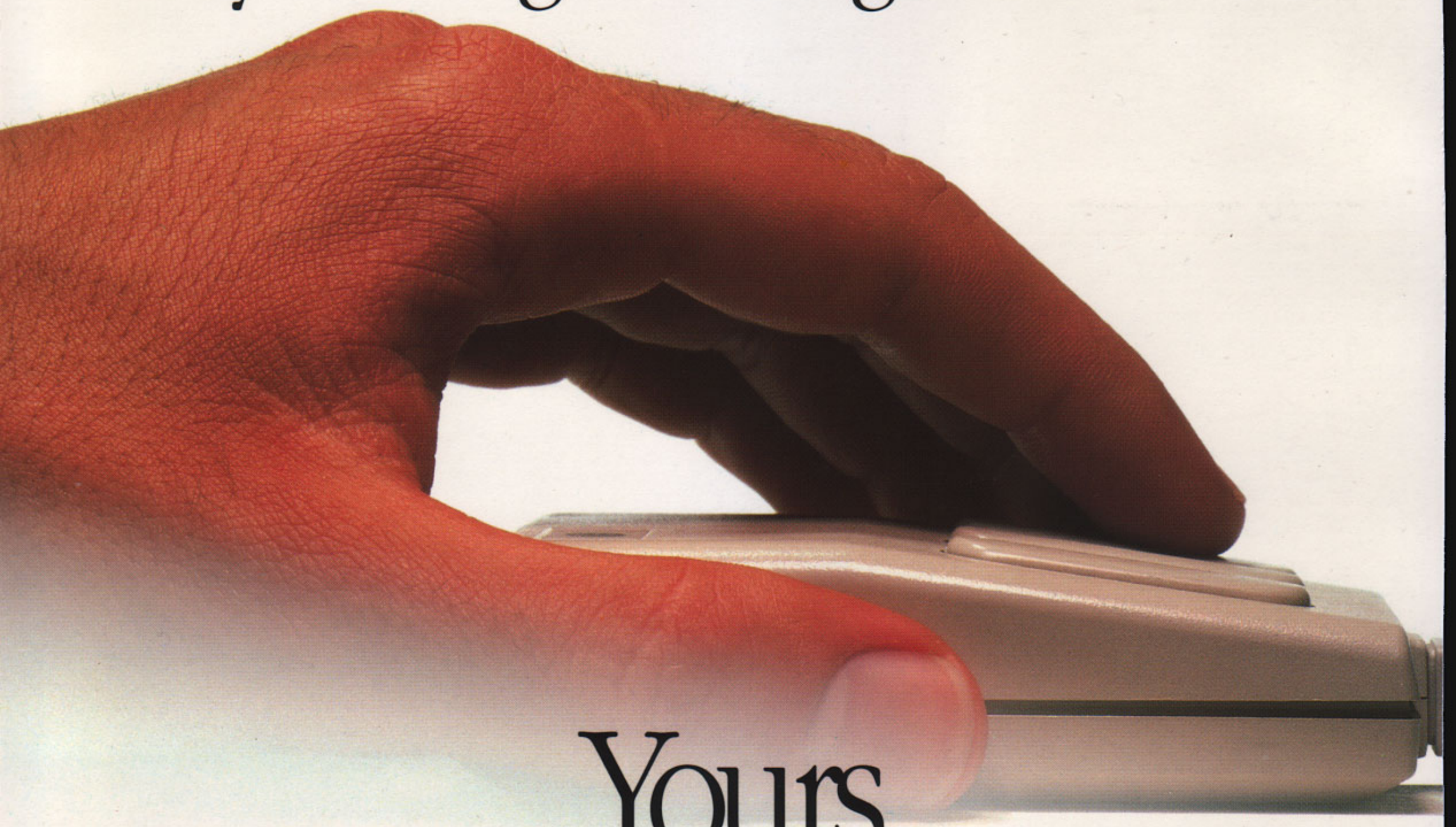

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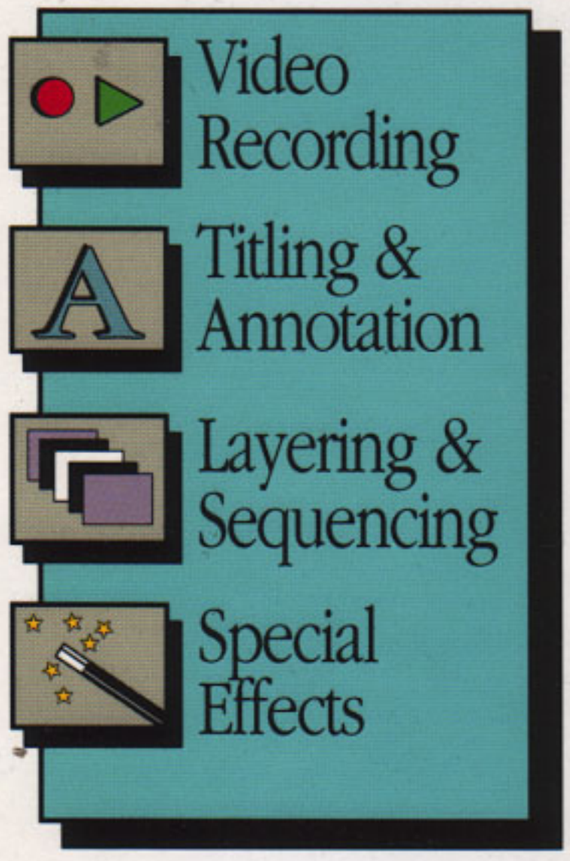

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